DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1984

by

Charles Avery and others

United States Geological Survey

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CONVERSION FACTORS

Most values in this report are given in inch-pound units. Conversion factors to metric units are shown below.

Multiply	By	To obtain
Acre-foot	1233	Cubic meter
Foot	0.3048	Meter
Inch	25.40	Millimeter
Mile	1.609	Kilometer

Chemical concentration is given only in metric units--milligrams per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million.

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1984

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U.S. Geological Survey

INTRODUCTION

This is the twenty-first in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, provide data to enable interested parties to keep abreast of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawals from wells, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing ground-water level contours are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of selected major areas of ground-water development in the State for the calendar year 1983. Water-level fluctuations, however, are described for spring 1983 to spring 1984. Much of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1983:

Ground-water conditions in Utah, Spring of 1983, by Cynthia L. Appel and others, Utah Division of Water Resources Cooperative Investigations Report 23.

Ground-water hydrology and projected effects of ground-water withdrawals in the Sevier Desert, Utah, by W. F. Holmes, U.S. Geological Survey Open-File Report 83-688 (pending publication as Utah Department of Natural Resources Technical Publication 79).

Ground water in the southeastern Uinta Basin, Utah and Colorado, by W. F. Holmes and B. A. Kimball, U.S. Geological Survey Open-File Report 83-271 (pending publication as U.S. Geological Survey Water-Supply Paper 2248).

Ground water in Utah's rapidly growing Wasatch Front area--the challenges and the choices, by Don Price, U.S.Geological Survey Water-Supply Paper 2232 (in preparation).

Ground-water units and withdrawals, Basin and Range province, Utah, by M. S. Bedinger, J. S. Gates, and J. R. Stark, U.S. Geological Survey Water-Resources Investigations Report 83-4122A.

Hydrology of Area 56, Northern Great Plains and Rocky Mountain Coal Provinces, Utah and Colorado, by G. C. Lines and others, U.S. Geological Survey Water-Resources Investigations Open-File Report 83-38 (in preparation).

Hydrology of the Ferron Sandstone aquifer and effects of proposed surface-coal mining in Castle Valley, Utah, by G. C. Lines and D. J. Morrissey, U.S. Geological Survey Water-Supply Paper 2195.

Hydrology of the Price River basin, Utah, with emphasis on selected coal-field areas, by K. M. Waddell, J. E. Dodge, D. W. Darby, and S. M. Theobald, U.S. Geological Survey Open-File Report 83-208 (pending publication as U.S. Geological Survey Water-Supply Paper 2246).

Potential hydrologic impacts of a tar-sand industry in 11 Special Tar Sand Areas in eastern Utah, by K. L. Lindskov and others, U.S. Geological Survey Water-Resources Investigations Report 83-4109.

Reconnaissance of the shallow-unconfined aquifer in Salt Lake Valley, Utah, by R. L. Seiler and K. M. Waddell, U.S. Geological Survey Water-Resources Investigations Report 83-4272.

Selected hydrologic data, Kolob-Alton-Kaiparowits coal-fields area, south-central Utah, by G. G. Plantz, U.S. Geological Survey Open-File Report 83-871 (also duplicated as Utah Hydrologic Data Report 41).

Three-dimensional digital-computer model of the principal ground-water reservoir of the Sevier Desert, Utah, by W. F. Holmes, U.S. Geological Survey Water-Resources Investigations Report 83-4179.

Water budget and ground-water occurrence in the Uinta Basin of Utah, by W. F. Holmes, in Uinta Basin Geologic Resources: Utah Geological Association Guidebook (in preparation).

Water levels, springs, and depth to water, Basin and Range province, Utah, by M. S. Bedinger, J. L. Mason, W. H. Langer, J. S. Gates, and D. A. Mulvihill, U.S. Geological Survey Water-Resources Investigations Report 83-4122B.

Water resources and potential hydrologic effects of oil-shale development in the southeastern Uinta Basin, Utah and Colorado, by K. L. Lindskov and B. A. Kimball, U.S. Geological Survey Open-File Report 83-216 (pending publication as U.S. Geological Survey Professional Paper 1307).

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The major areas of ground-water development discussed in this report are shown in figure 1 and named in table 1. Relatively few wells outside of these areas yield large supplies of water of good chemical quality for the uses listed above, although some of the basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contain fractures or other openings enlarged by solution; and sandstone, which contains open fractures. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these materials. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with rock material eroded from the adjacent mountains.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah during 1983 was about 607,000 acre-feet, which is about 183,000 acre-feet less than during 1982 and about 215,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease in withdrawal primarily was due to a decrease in withdrawal for irrigation and public supply. Total withdrawal for irrigation during 1983 was about 334,000 acre-feet (table 2), which is 170,000 acre-feet less than reported for 1982. Withdrawal for public supply was 130,000 acre-feet, which is 14,000 acre-feet less than during 1982. Withdrawal for industry was 80,000 acre-feet, which is slightly less than reported for 1982. Withdrawals for domestic and stock use was 63,000 acre-feet, which is 5,000 acre-feet greater than during 1982. This increase, however, was mostly a result of using a new method of determining well discharge in northern Utah Valley.

The quantity of water withdrawn from wells is related to local climatic conditions. Precipitation during 1983 was above average throughout Utah (National Oceanic and Atmospheric Administration, 1984). Of the 33 weather stations for which graphs of cumulative departure from average annual precipitation are included in this report, seven stations recorded about twice the average annual amount. This year is the second consecutive year in which precipitation was generally above normal.

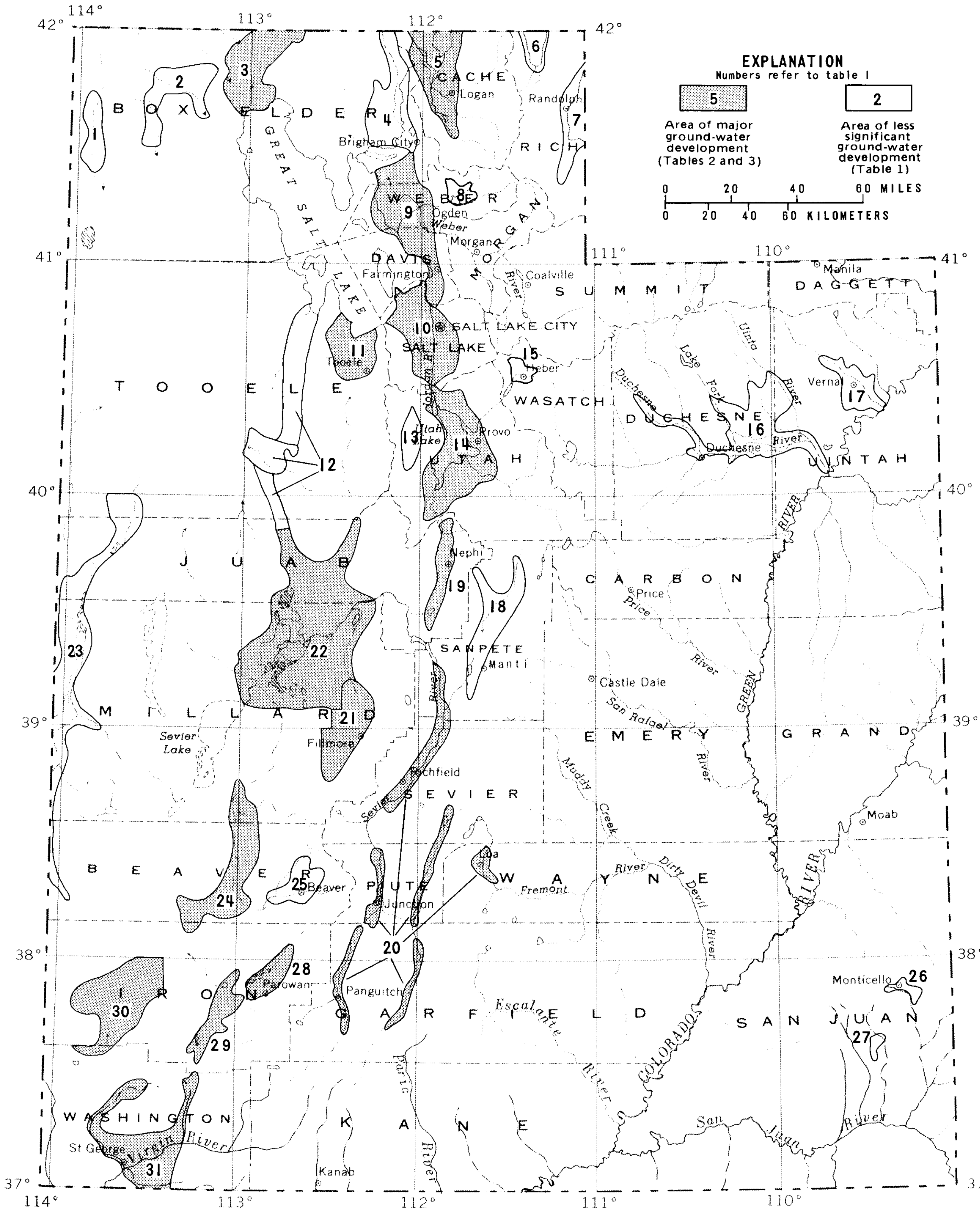

Figure 1.--Areas of ground-water development specifically referred to in this report.

Table 1.—Areas of ground-water development in Utah specifically referred to in this report

Number in figure 1	Area	Principal type of water-bearing rocks
1	Grouse Creek valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Salt Lake Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
	Skull Valley	Do.
	Old River Bed	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pavant Valley	Do.
22	Sevier Desert	Unconsolidated
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Consolidated
27	Blanding area	Do.
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

Table 2.—Well construction and withdrawal of water from wells in Utah

Number of wells constructed in 1983.--Data provided by Utah Department of Natural Resources, Division of Water Rights. Includes deepened and replacement wells.

Diameter of 6 inches or more.--Constructed for irrigation, industry, or public supply.

Estimated withdrawals from wells.--

1982 total From Appel and others (1983, table 2), includes some unpublished revisions.

1973-82 average annual: Calculated from previous reports of this series and also includes some previously unpublished revisions.

Area	Number in figure 1	Number of wells constructed in 1983: Total	Number of wells constructed in 1983: Diameter of 6 inches or more	Estimated withdrawals from wells (acre-feet), 1983: Irrigation	1983: Industry	1983: Public supply	1983: Domestic and stock	1983: Total (rounded)	1982 total	1973-82 average annual
Curlew Valley	3	1	1	17,600	0	50	50	18,000	26,000	27,000
Cache Valley	5	21	5	9,600	6,800	2,200	1,800	20,000	26,000	27,000
East Shore area	9	25	1	[1] 11,400	7,600	24,300	--	43,000	38,000	41,000
Salt Lake Valley	10	22	6	1,300	30,500	55,900	29,000	117,000	125,000	128,000
Tooele Valley	11	23	2	[1] 17,000	500	4,000	150	22,000	26,000	29,000
Utah and Goshen Valleys	14	24	2	29,100	10,500	14,500	19,900	74,000	86,000	101,000
Juab Valley	19	2	0	4,300	50	850	300	6,000	16,000	22,000
Sevier Desert	22	16	0	6,100	1,200	860	300	8,000	16,000	29,000
Upper and central Sevier Valleys and upper Fremont River valley	20	19	0	12,000	200	3,500	5,500	21,000	28,000	24,000
Pavant Valley	21	1	0	41,500	100	440	300	42,000	69,000	88,000
Cedar City Valley	29	10	5	17,200	900	2,500	400	21,000	28,000	32,000
Parowan Valley	28	5	2	[2] 21,800	300	100	200	22,000	25,000	29,000
Escalante Valley										
Milford area	24	6	3	37,600	0	900	300	39,000	55,000	60,000
Beryl-Enterprise area	30	9	3	66,500	18,200	370	750	86,000	99,000	82,000
Other areas[3]		193	25	41,100	3,200	19,400	4,200	68,000	127,000	103,000
Totals (rounded)		377	55	334,000	80,000	130,000	63,000	607,000	790,000	822,000

[1] Includes some domestic and stock use.

[2] Includes some use for stock.

[3] Withdrawals are estimated minimum amounts.

The above average precipitation resulted in abundant surface-water supplies, and this resulted in the decreased use of ground water for irrigation and public supply. The above average precipitation throughout Utah during 1983 also resulted in increased recharge to the ground-water reservoirs. The combination of these two effects of the above average precipitation resulted in rises of water levels, which in some areas were quite large, throughout most of the State from spring of 1983 to spring of 1984. Continued large withdrawal for irrigation, however, resulted in a decline of water levels in most of the Beryl-Enterprise area of Escalante Valley.

The total number of wells drilled during 1983 (table 2), as indicated by well-drillers' reports filed with the Utah Division of Water Rights, was about 35 percent less than reported for 1982. The number of large-diameter wells mostly constructed for public supply, irrigation, and industrial use was about 30 percent less than reported for 1982.

The larger ground-water basins and those containing most of the ground-water development in Utah are shown on figure 1. Table 2 gives information about the number of wells constructed, withdrawals of water from wells constructed, withdrawals of water from wells for principal uses, and total withdrawals during 1983 for the major areas of ground-water development. For comparison, total withdrawals during 1982 and average annual withdrawals for 1973-82 also are shown in table 2. Table 3 shows the annual withdrawals from the major areas of ground-water development for 1973-82.

Table 3.--Total annual withdrawal of water from wells in major areas of ground-water development in Utah, 1973-82

[From previous reports in this series.]

Area	Number in figure 1	Thousands of acre-feet									
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Curlew Valley	3	19	22	21	27	31	27	29	30	40	26
Cache Valley	5	24	24	25	27	32	26	28	25	33	26
East Shore area	9	41	47	38	37	48	36	46	45	36	[1] 38
Salt Lake Valley	10	129	130	122	124	119	127	136	128	136	[1] 125
Tooele Valley	11	29	33	29	30	28	30	30	27	30	26
Utah and Goshen Valleys	14	89	106	98	107	118	104	107	94	101	86
Juab Valley	19	17	31	25	29	29	19	21	15	21	16
Sevier Desert	22	20	26	26	34	50	40	45	13	18	16
Upper and central Sevier Valleys and upper Fremont River valley	20	19	20	24	25	26	26	24	24	25	28
Pavant Valley	21	69	101	98	95	117	88	86	75	80	69
Cedar City Valley	29	27	42	28	37	40	31	32	28	29	[1] 28
Parowan Valley	28	26	31	28	34	33	29	30	28	27	25
Escalante Valley											
Milford area	24	52	70	60	65	65	58	49	61	69	55
Beryl-Enterprise area	30	74	93	85	79	81	71	79	71	93	99
Other areas		76	101	79	106	126	112	112	90	105	127
Totals		711	877	786	856	943	824	854	754	843	[1] 790

[1] Previously unpublished revision.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CURLEW VALLEY

By L. R. Herbert

Withdrawal of water from wells in Curlew Valley in 1983 was about 18,000 acre-feet, a decrease of 8,000 acre-feet from the amount reported in 1982, and 9,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease was due to decreased withdrawal for irrigation.

Water levels in all observation wells in Curlew Valley rose from March 1983 to March 1984 (fig. 2) due to decreased withdrawal for irrigation and increased recharge from precipitation. The maximum observed rise was 16.5 feet in a well west of Snowville.

The relation of water levels in two selected observation wells to cumulative departure from average annual precipitation at Snowville and annual withdrawals from wells is shown in figure 3. Although the water level in well (B-14-9)7bbb-1 rose from 1982 to 1984, the overall water-level trend in the well has been downward since 1965 due to increased withdrawals from the ground-water reservoir. Precipitation at Snowville in 1983 was 21.99 inches, 9.43 inches above the average annual precipitation for 1941-83.

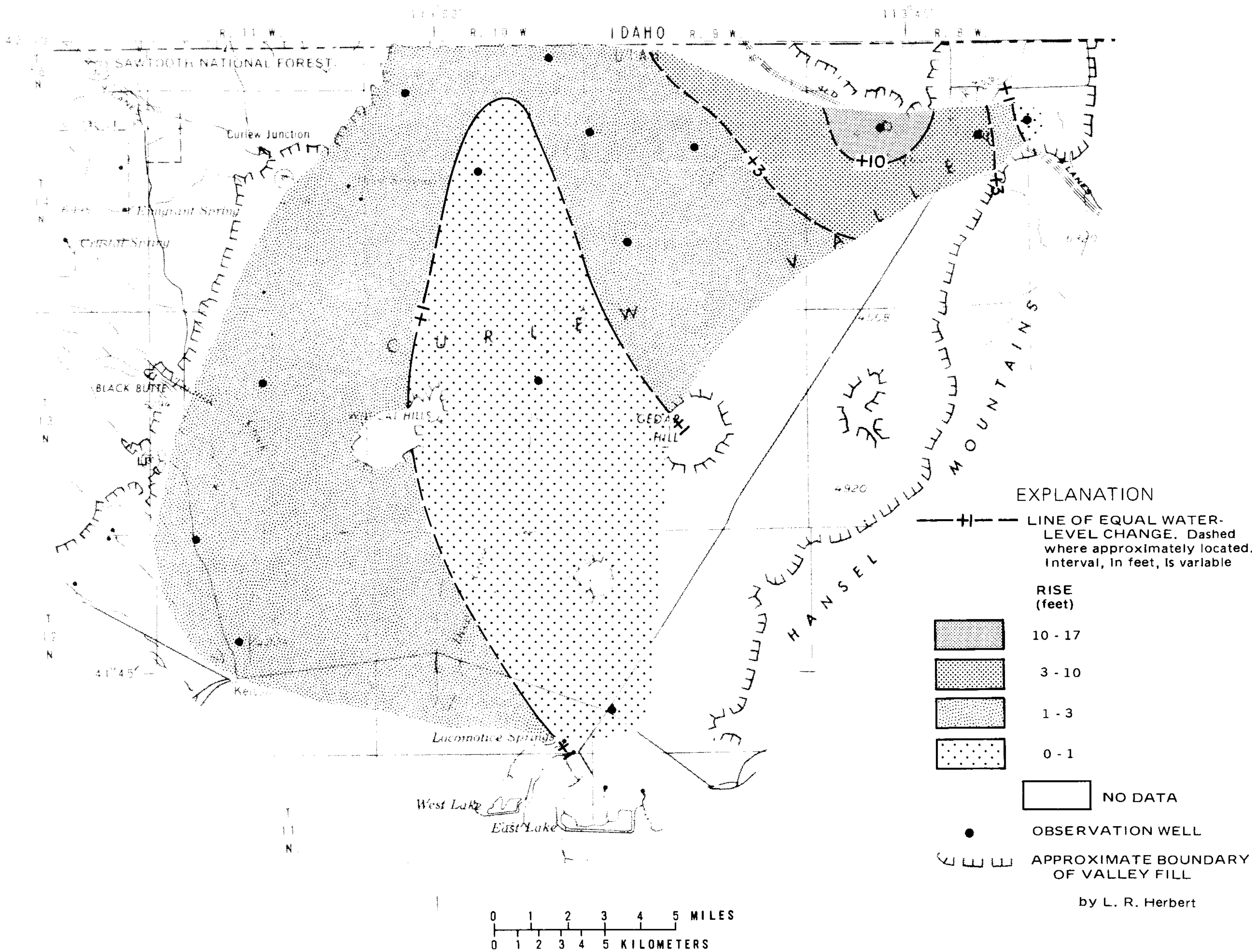

Figure 2.—Map of Curlew Valley showing change of water levels from March 1983 to March 1984.

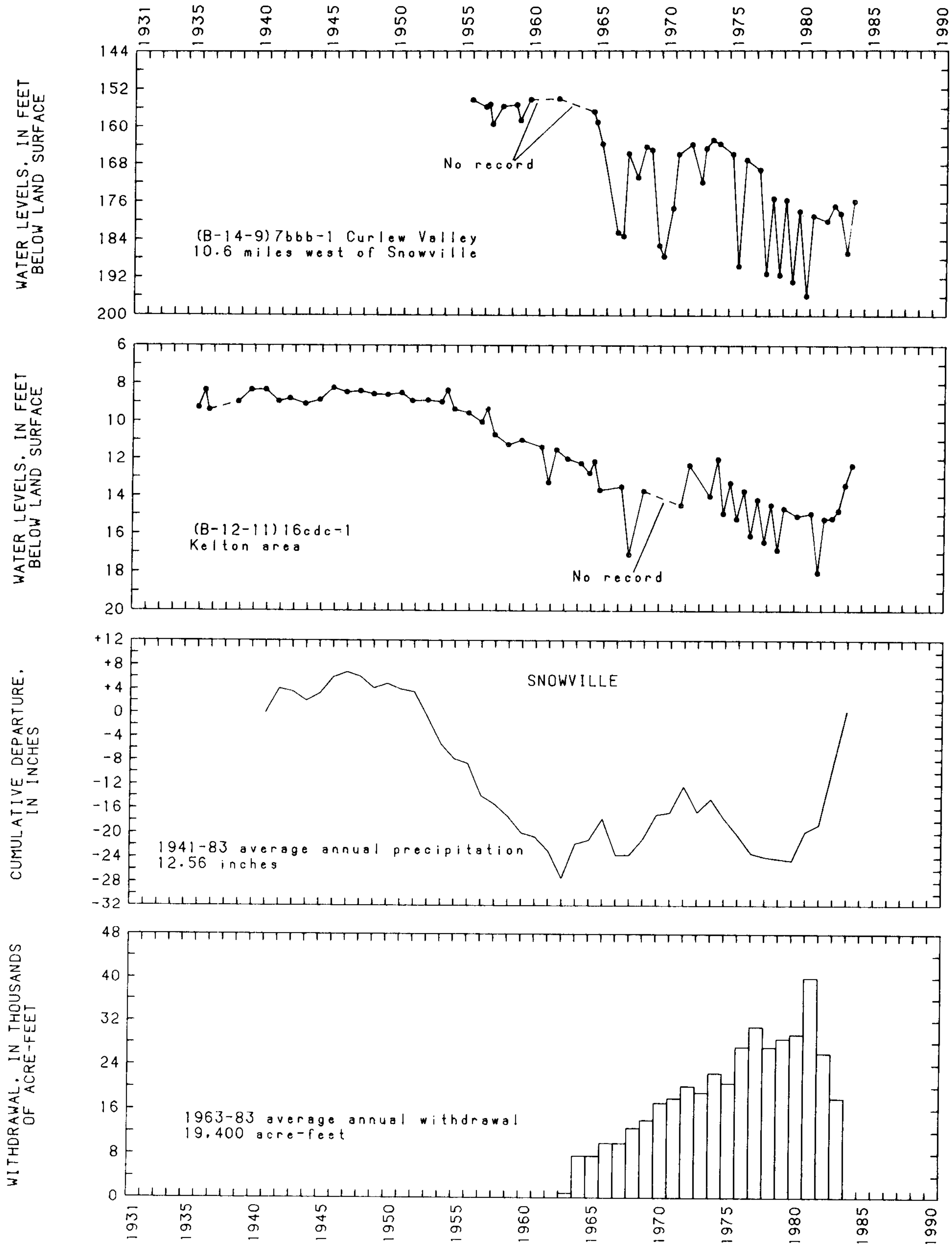

Figure 3.—Relation of water levels in selected wells in Curlew Valley to cumulative departure from the average annual precipitation at Snowville and to annual withdrawals from wells.

CACHE VALLEY

by Don A. Bischoff

Approximately 20,000 acre-feet of water was withdrawn from wells in Cache Valley during 1983. This was 6,000 acre-feet less than the amount withdrawn in 1982 and about 7,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease was mainly a result of the availability of greater than average supplies of surface water for irrigation. Discharge of the Logan River during 1983 was about 270,800 acre-feet, which is 9,100 acre-feet more than reported in 1982 and about 150 percent of the average annual discharge for 1941-82.

Water levels in most of Cache Valley rose from March 1983 to March 1984 due to above average precipitation and the decreased withdrawals from wells (fig. 4). Rises ranged from less than 2 feet in the central part of the valley to nearly 4 feet in a well south of Cache Junction. Declines of less than 2 feet were measured near Clarkston and in the northern part of the area west of Richmond, and a decline of more than 2 feet was measured near Hyrum. The long-term trend of water levels in well (A-12-1)29cab-1, annual discharge of the Logan River near Logan, cumulative departure from average annual precipitation at Logan Utah State University and annual withdrawals from wells are compared in figure 5. Precipitation during 1983 was 35.85 inches, 17.19 inches above the average annual precipitation for 1941-83. The above average precipitation resulted in above average streamflow and decreased ground-water withdrawals in most of the valley.

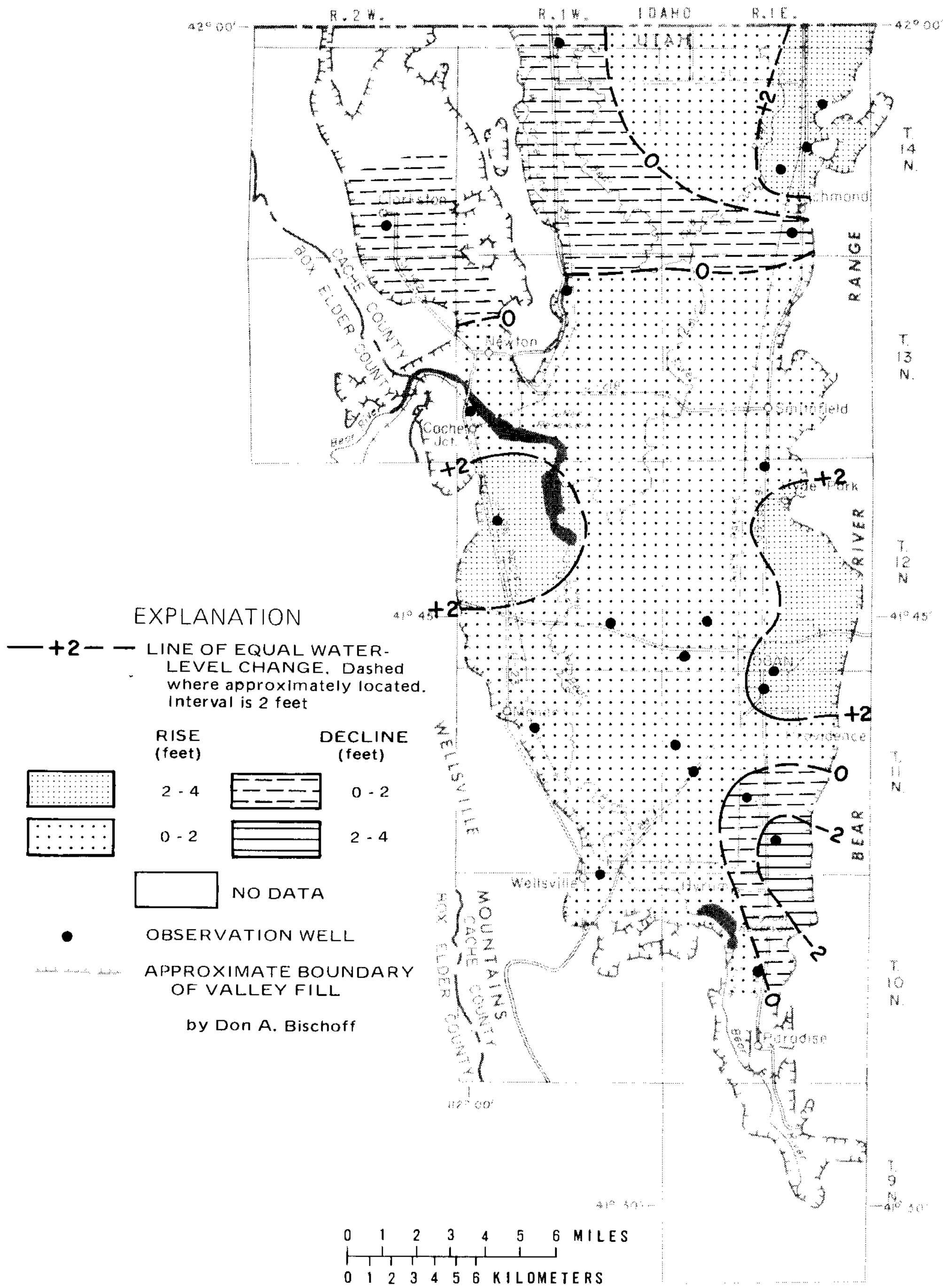

Figure 4.—Map of Cache Valley showing change of water levels from March 1983 to March 1984.

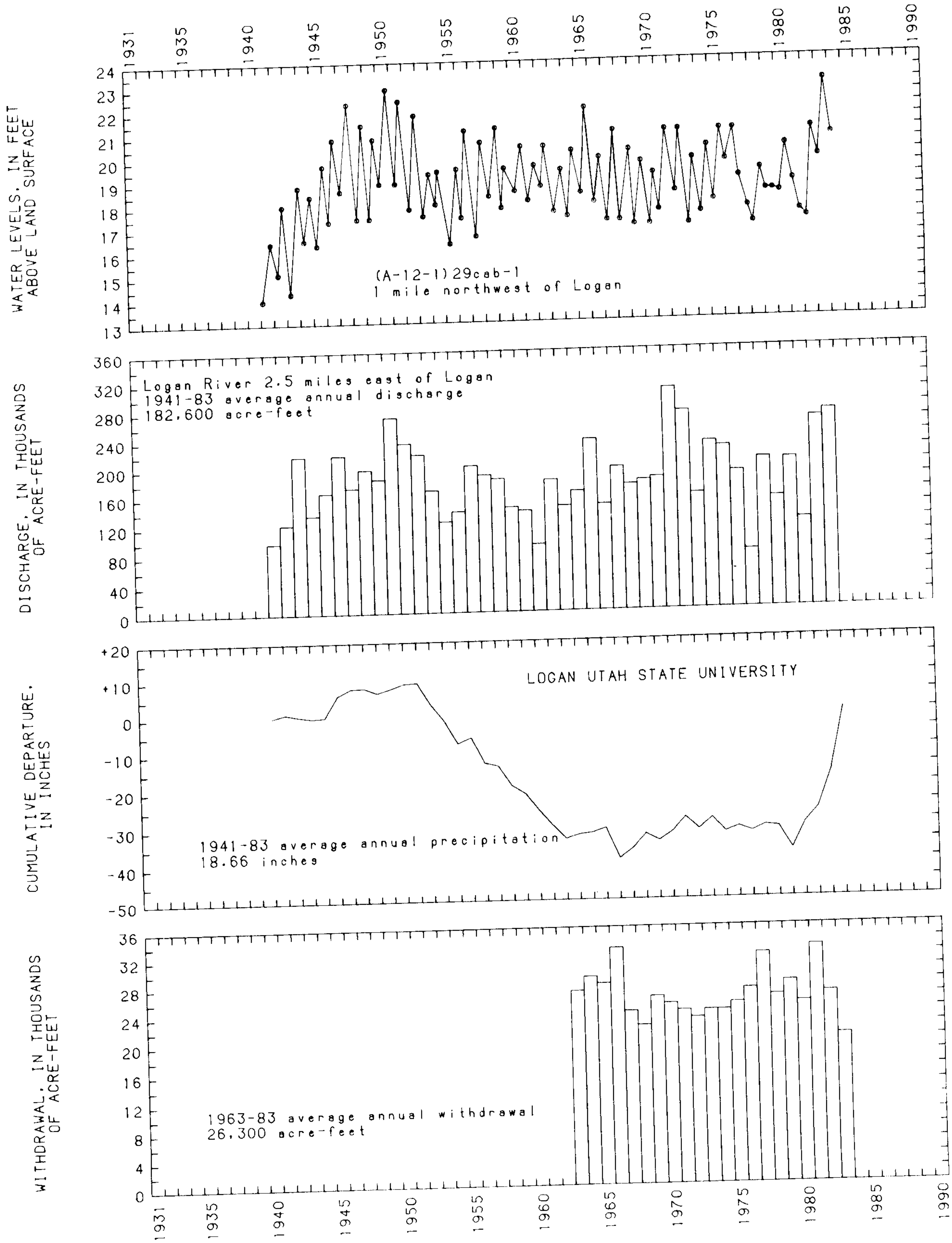

Figure 5.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan, to cumulative departure from the average annual precipitation at Logan Utah State University, and to annual withdrawals from wells.

EAST SHORE AREA

By David W. Clark

Withdrawal of water from wells in the East Shore area in 1983 was about 43,000 acre-feet, 5,000 acre-feet more than the withdrawal in 1982, and 2,000 acre-feet more than the average annual withdrawal for 1973-82 (table 2). The increased withdrawal was due to increases for public supply and irrigation.

Water levels from March 1983 to March 1984 rose in most of the East Shore area (fig. 6) due to above average precipitation. Rises between 10 and 16 feet occurred in some of the recharge areas. Declines of about 8 feet occurred in an area south of Ogden due to increased withdrawals for public supply in that area.

The long-term relation of water levels in selected observation wells to precipitation at the Ogden Pioneer Powerhouse and withdrawal from wells is shown in figure 7. The 1982 precipitation of 42.73 at the Ogden Pioneer Powerhouse was 21.00 inches above the average annual precipitation for 1937-83 at that site. The rise in water levels in the observation wells reflects the effect of this above average precipitation.

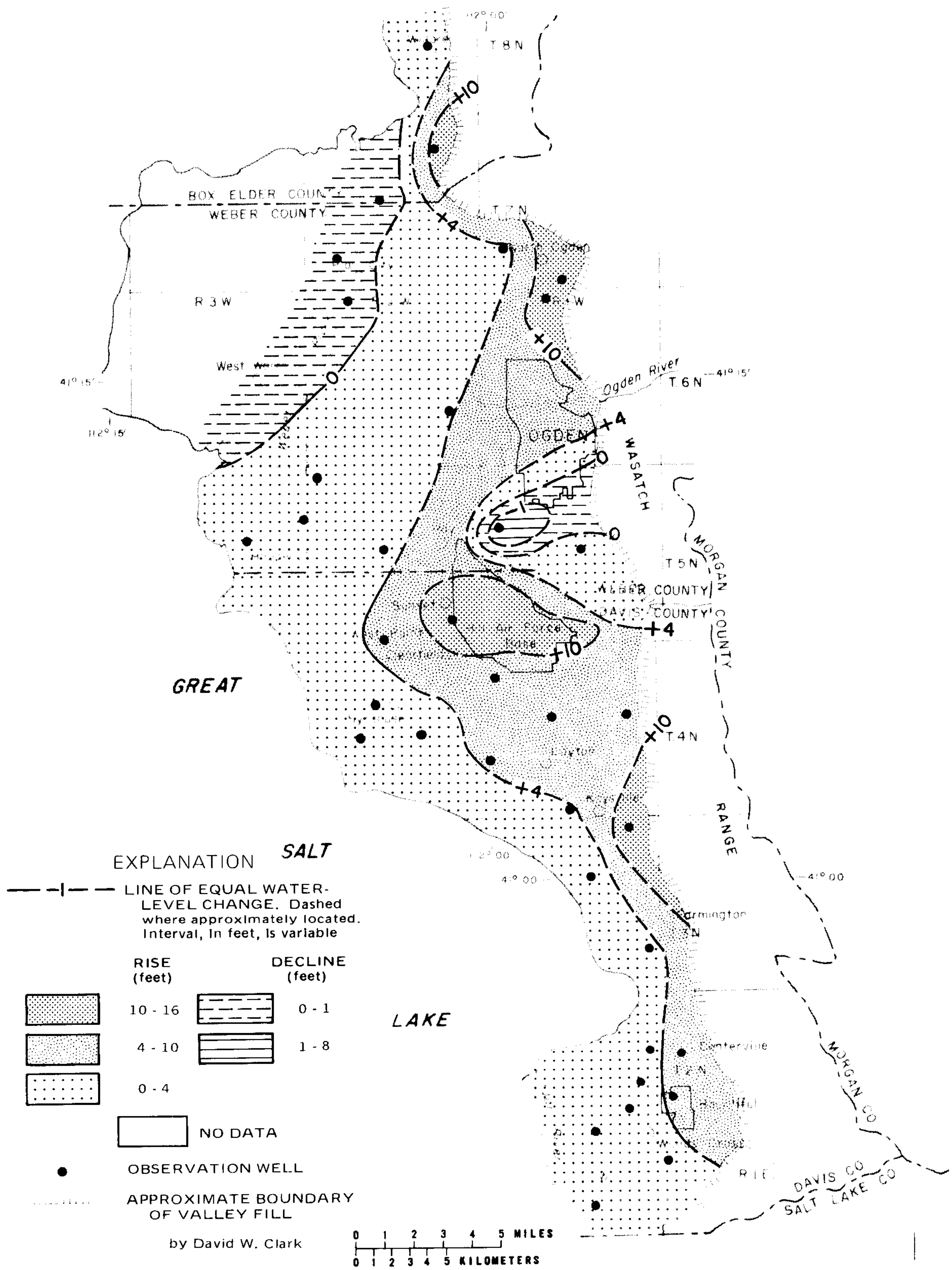

Figure 6.—Map of the East Shore area showing change of water levels from March 1983 to March 1984.

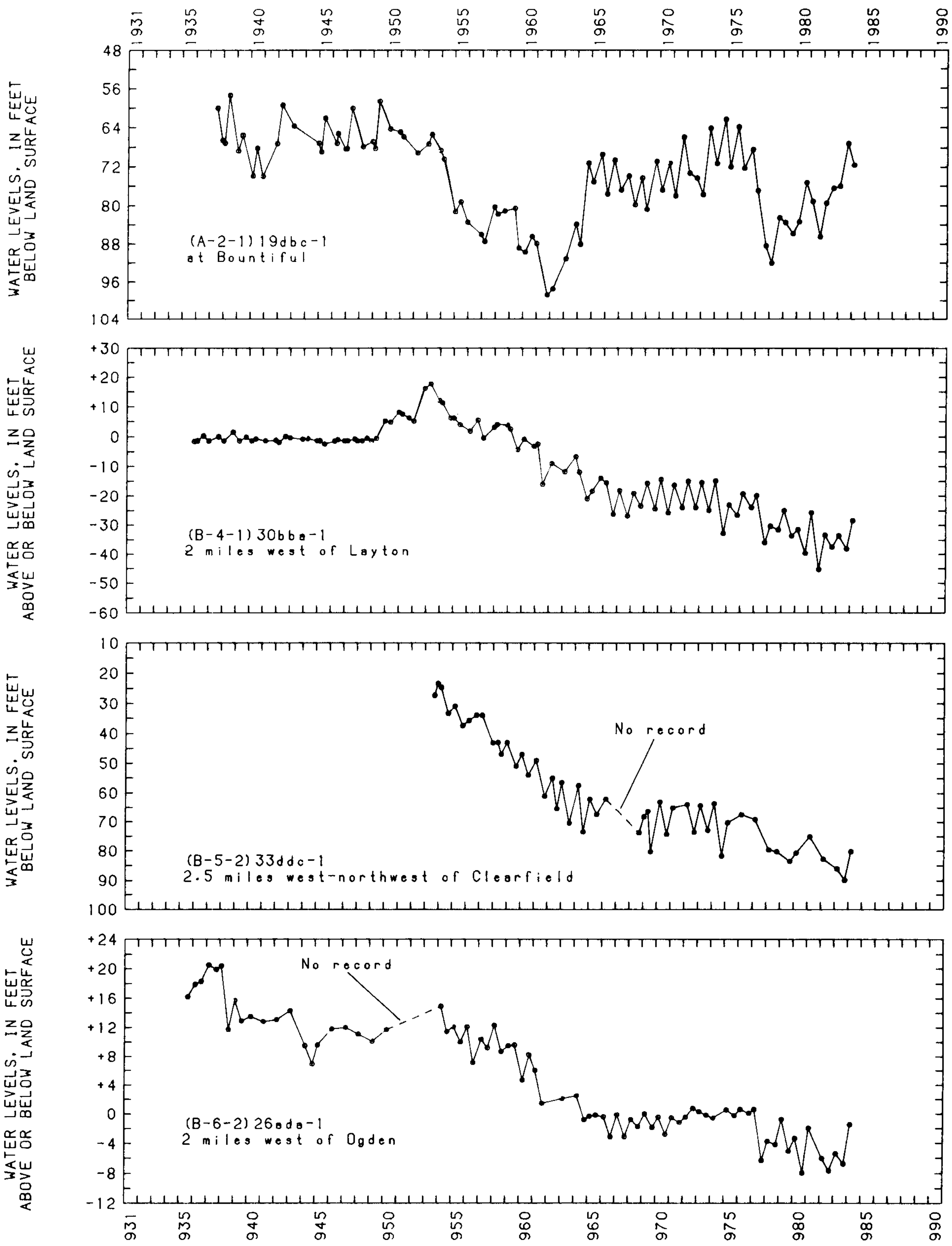

Figure 7.—Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer Powerhouse and to annual withdrawals from wells.

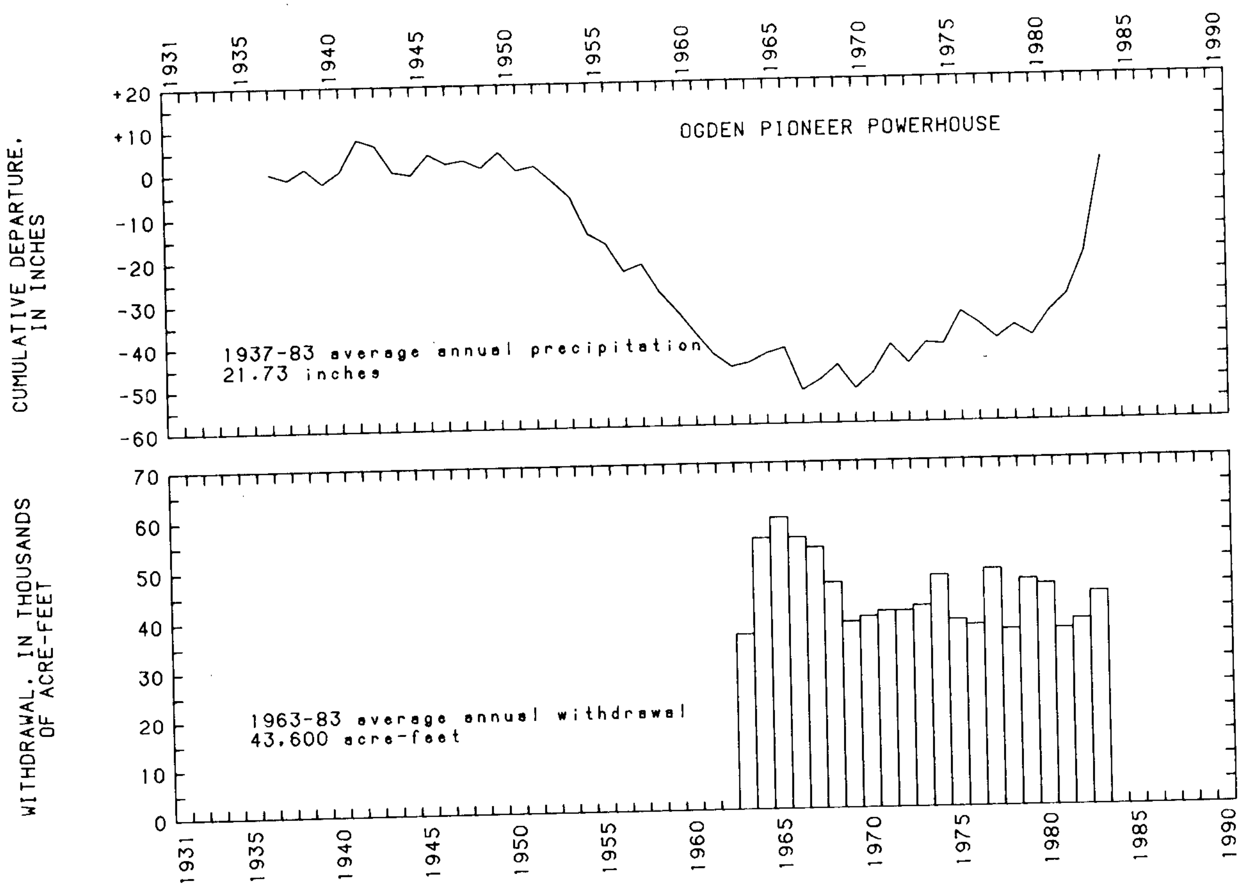

Figure 7.—Continued

SALT LAKE VALLEY

By Ralph L. Seiler

Withdrawal of water from wells in the Salt Lake Valley in 1983 was about 117,000 acre-feet, about 8,000 acre-feet less than in 1982, and 11,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The estimate for 1982 (Appel and others, 1983, table 2) was revised based on additional data. Withdrawals decreased slightly in 1983 for irrigation, and domestic and stock supply. Withdrawal for public supply was about 5,500 acre-feet less than the 61,400 acre-feet withdrawn in 1982. The decreased withdrawals for irrigation and domestic and stock use probably were due to above average precipitation, whereas the decreased withdrawal for public supply probably was due to above average availability of surface-water supplies.

Water levels in the principal aquifer rose in most parts of the Salt Lake Valley from February 1983 to February 1984 (fig. 8). The average net change over the entire valley was a rise of about 2 feet. The rises were less than 4 feet in 66 percent of the valley, from 4 to 9 feet in about 23 percent of the valley, and greater than 9 feet in a small area south of Herriman. The largest rises were in wells along the Wasatch and Oquirrh Mountain fronts. Water levels declined in about 11 percent of the valley. Declines of 1 foot or less were measured in areas east of Magna, northwest of Salt Lake City, and in Salt Lake City. The largest decline, 4.1 feet, was measured in a well near Kearns.

The relation of water levels in selected observation wells in the principal aquifer to precipitation, total annual and public-supply withdrawals from wells, and population are shown in figures 9 and 10. Water levels rose from February 1983 to February 1984 in all wells for which hydrographs are shown except well (D-1-1)7abd-6, near the center of Salt Lake City, which showed a slight decline. Precipitation at Silver Lake Brighton was 65.44 inches, 22.62 inches above the average annual precipitation for 1931-83 and at the Salt Lake City WSO (International Airport) was 24.26 inches, 9.14 inches above the average annual precipitation for 1931-83.

Water levels in selected observation wells in the shallow water-table aquifer are shown in figure 11. Water levels in February and March 1984 were about the same as during the same period in 1983. Well (D-3-1)6bcb-1, in contrast to the other wells, has its lowest water levels during February and March and its highest water levels in late summer.

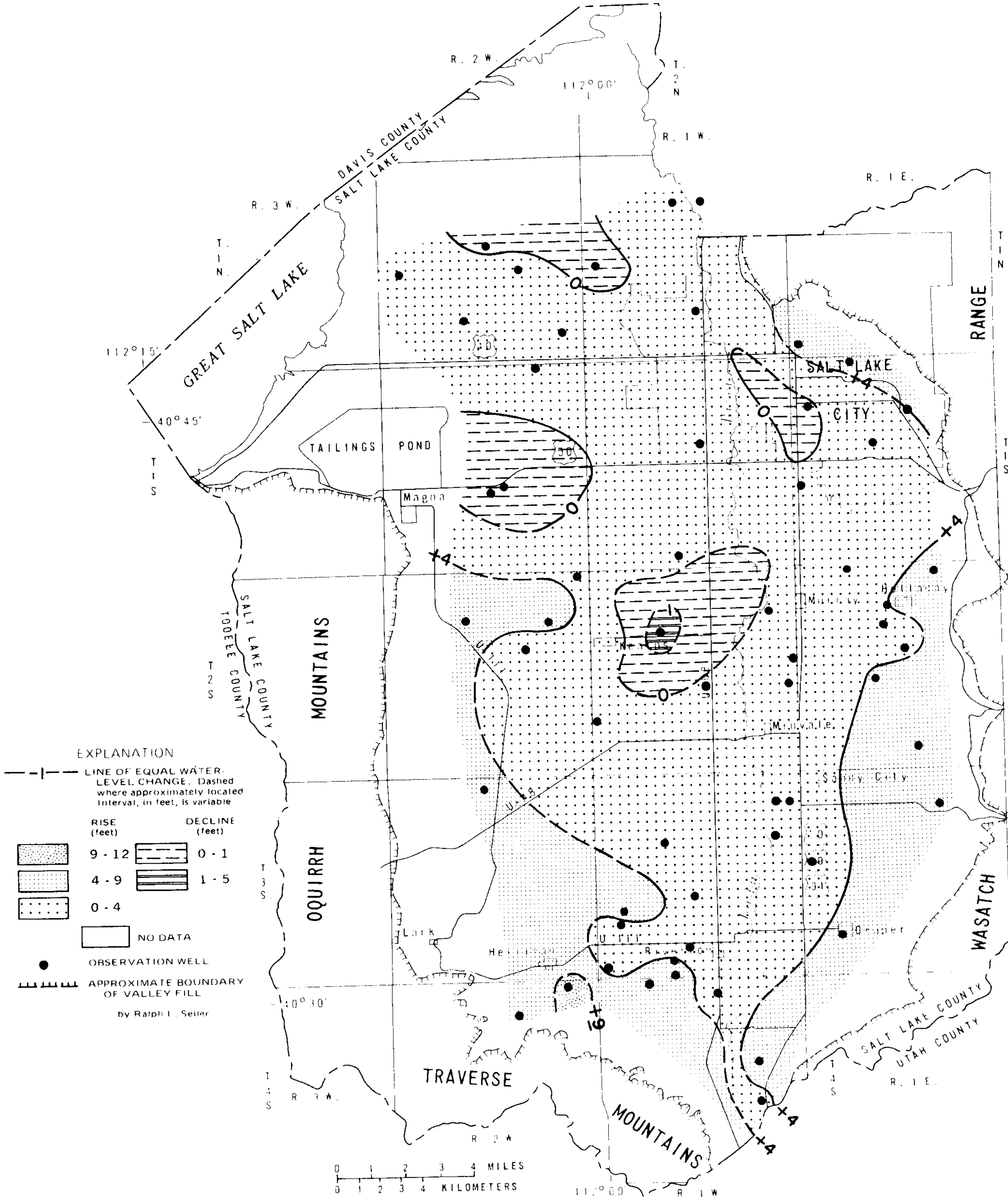

Figure 8.—Map of the Salt Lake Valley showing change of water levels in the principal aquifer from February 1983 to February 1984.

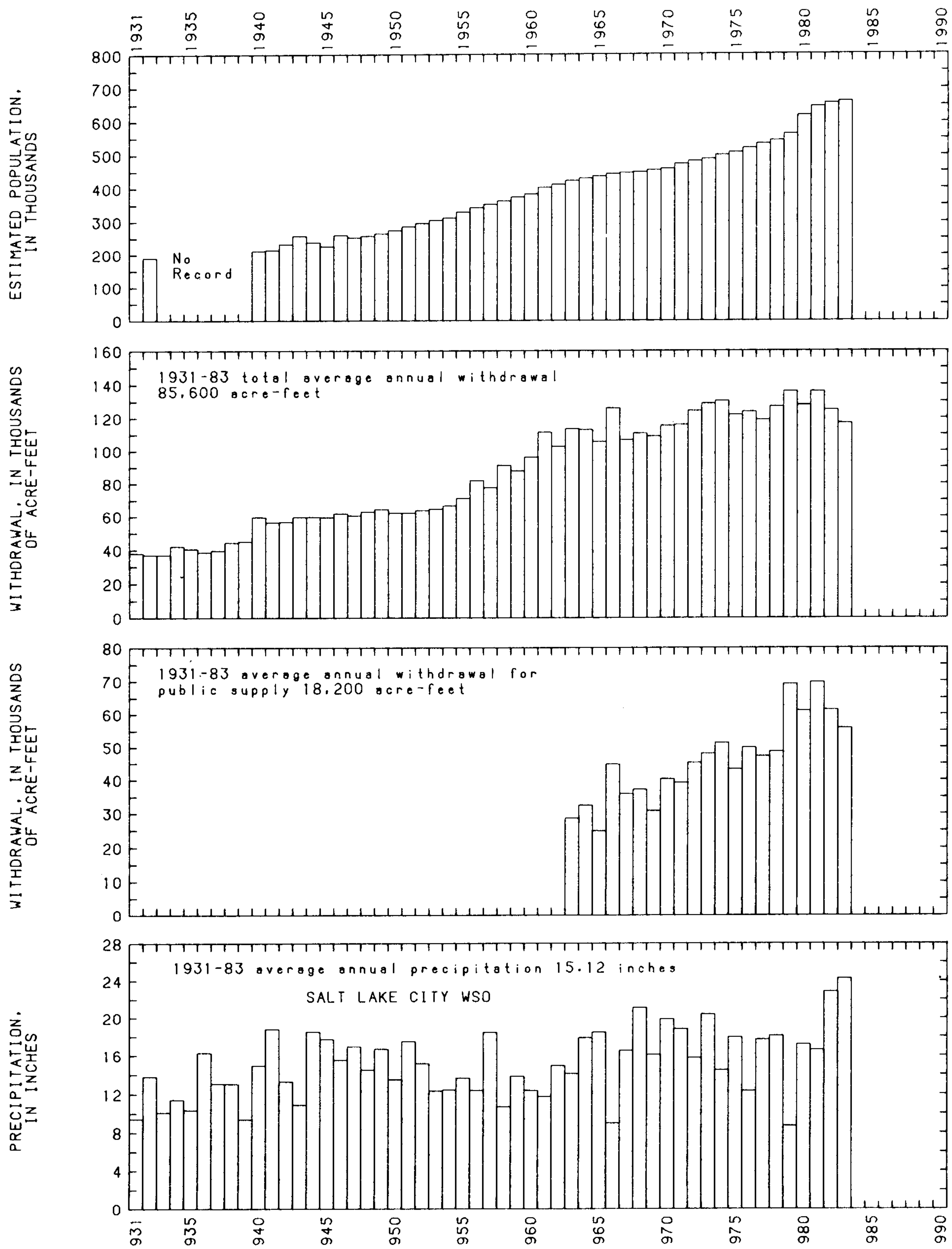

Figure 9.—Estimated population of Salt Lake County, total annual withdrawals from wells, annual withdrawal for public supply, and average annual precipitation at Salt Lake City WSO (International Airport).

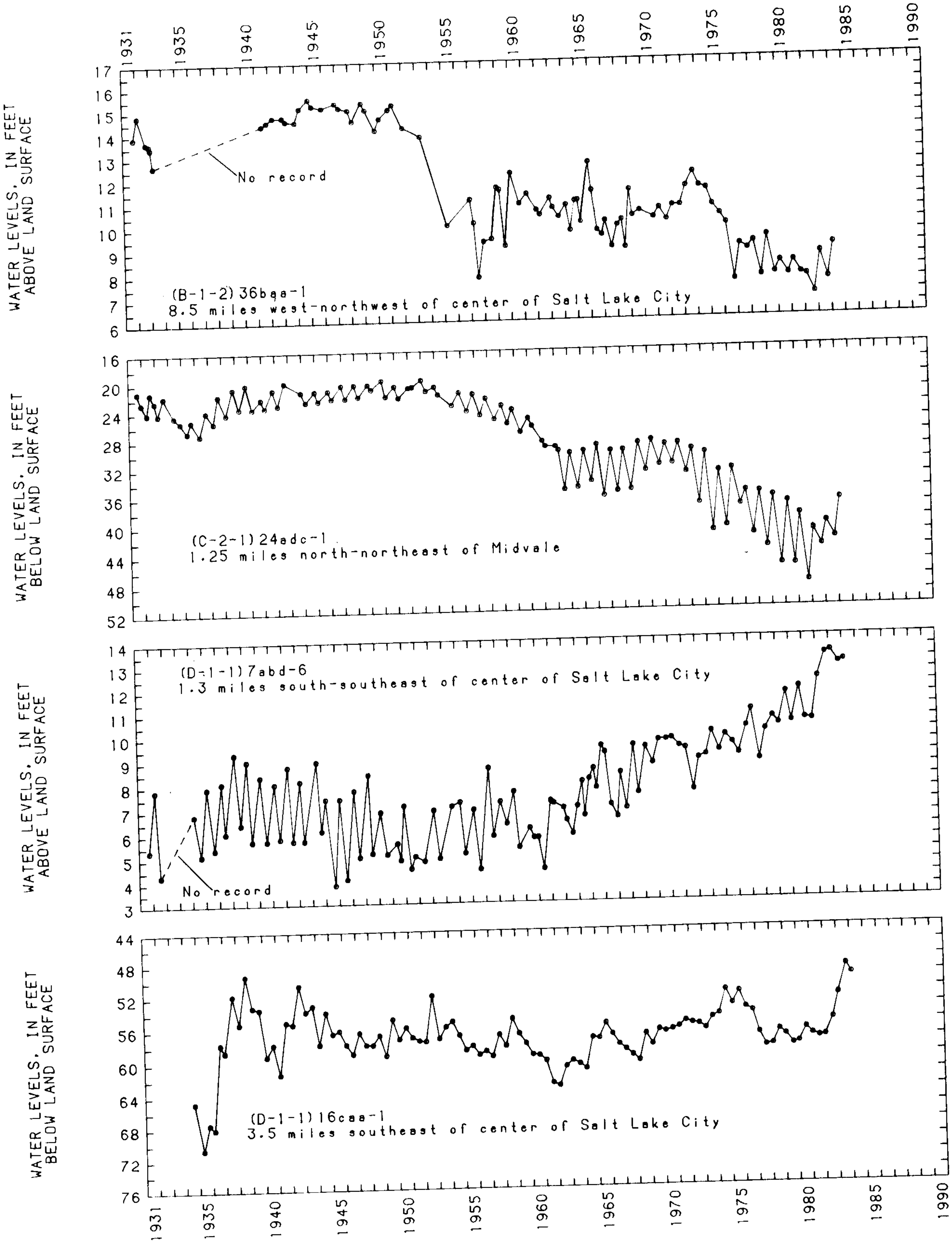

Figure 10.—Relation of water levels in selected wells in Salt Lake Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

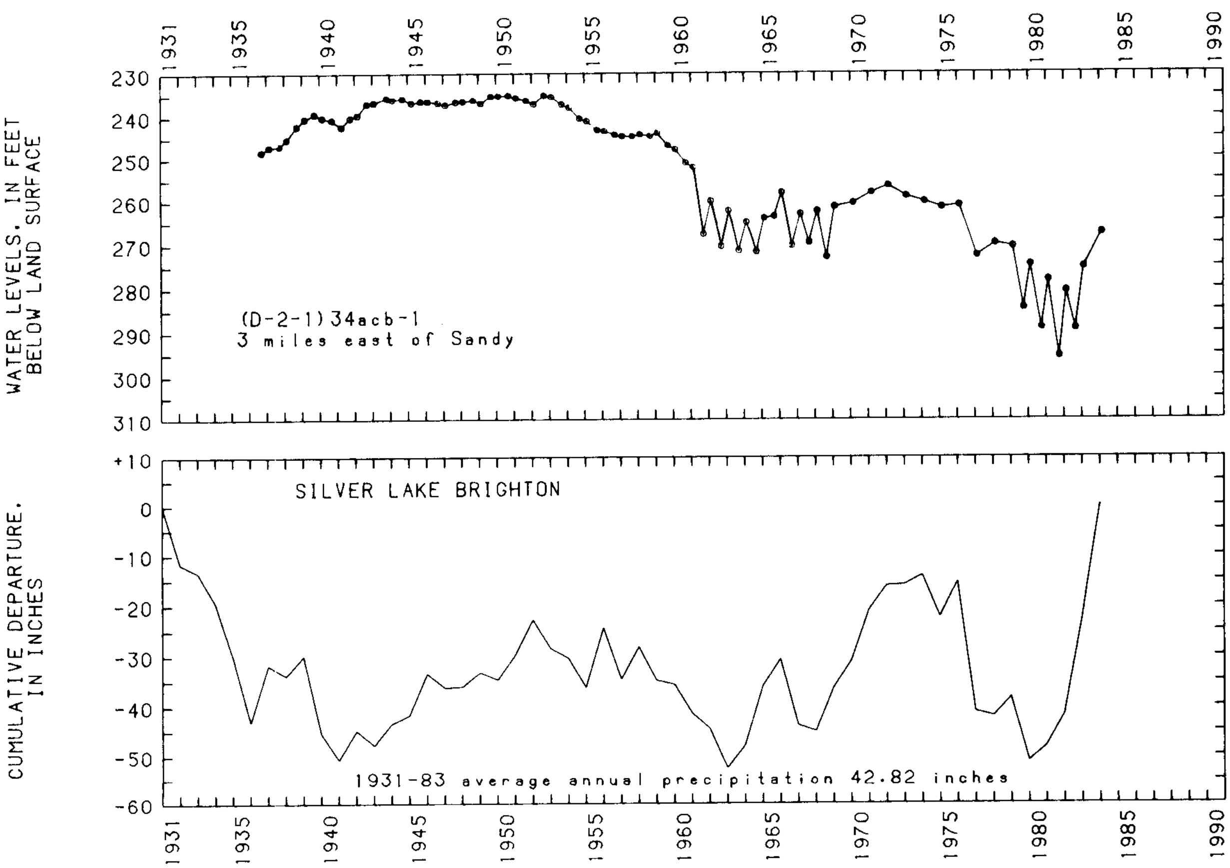

Figure 10.—Continued

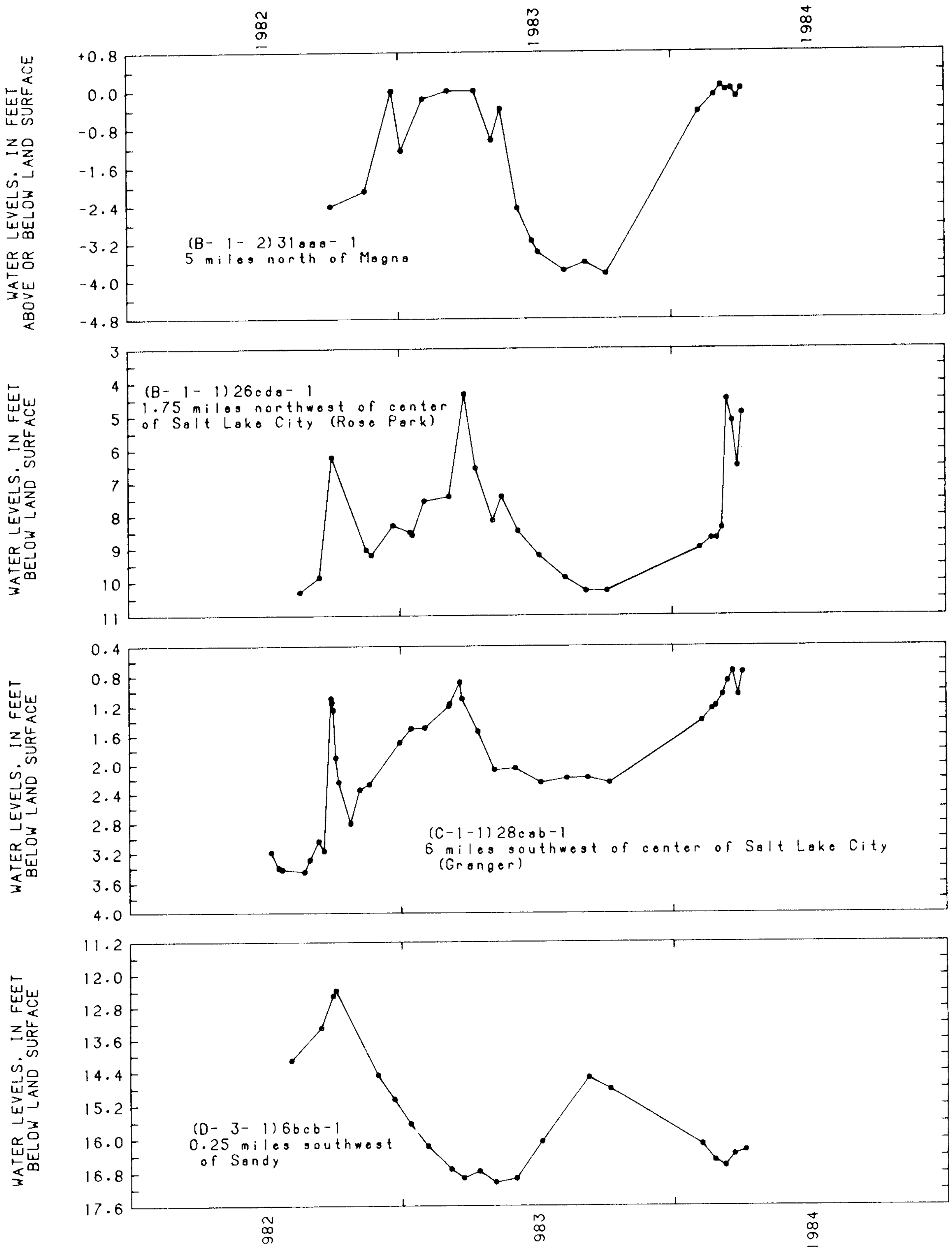

Figure 11.—Water levels in selected wells in the shallow water-table aquifer in Salt Lake Valley.

TOOELE VALLEY

By Kevin Guttormson

Withdrawal of water from wells in Tooele Valley in 1983 was approximately 22,000 acre-feet. This is 4,000 acre-feet less than the withdrawals in 1982 and 7,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease was due to decreased withdrawals for irrigation and public supply.

Discharge from Fishing Creek, Sixmile Creek, Mill Pond, and Dunnes Pond Springs (fig. 12) was approximately 26,900 acre-feet, which is 8,300 acre-feet more than reported in 1982. About 4,200 acre-feet of the spring discharge was used for irrigation and stock in the valley. The remaining 22,700 acre-feet was diverted to Salt Lake Valley for industrial use.

Water levels rose throughout Tooele Valley, with no recorded declines (fig. 12). Water levels rose less than 3 feet from March 1983 to March 1984 in the northern half of the valley, but rises of nearly 9 feet were recorded south of Grantsville. These rises may be attributed to recharge caused when excess streamflow was diverted onto the gravel benches southwest of Grantsville during spring runoff. Rises of nearly 13 feet were recorded in the Tooele area. These rises are attributed to decreased withdrawals for public supply and above average precipitation.

The relation of water levels in selected observation wells, precipitation at Tooele, and annual withdrawals from wells is shown figure 13.

Precipitation at Tooele in 1983 was 27.80 inches, which is 10.91 inches above the average annual precipitation for 1936-83.

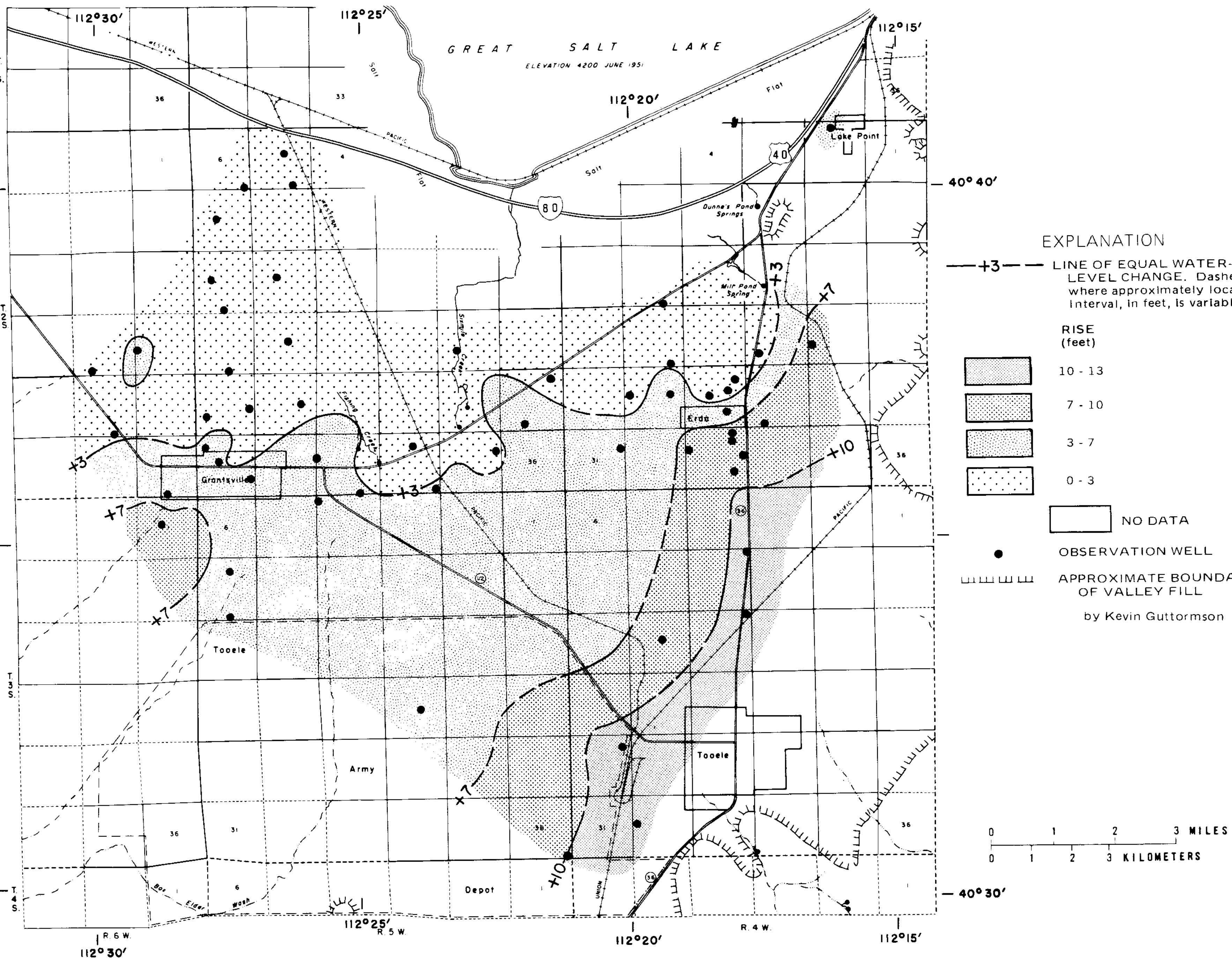

Figure 12.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1983 to March 1984.

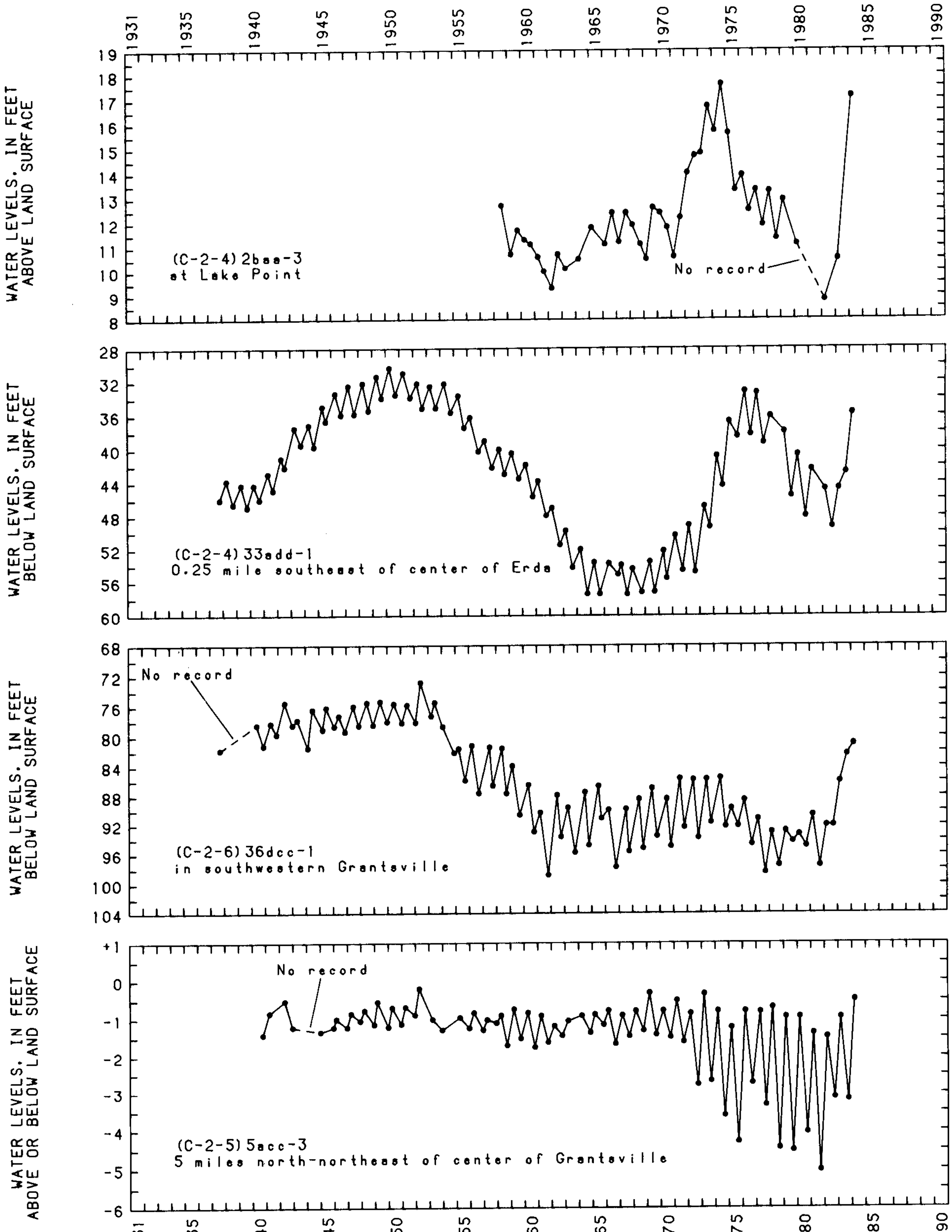

Figure 13.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele and to annual withdrawals from wells.

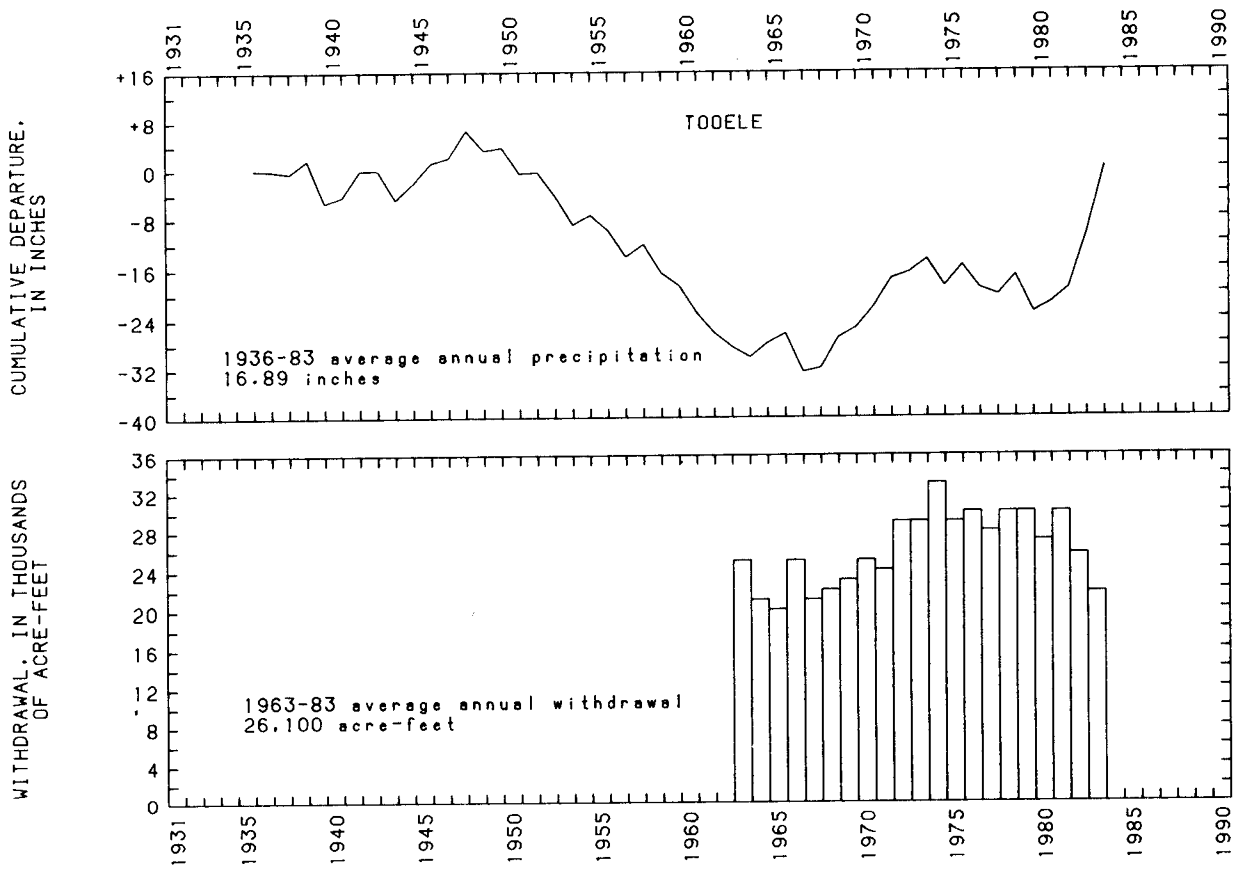

Figure 13.—Continued

UTAH AND GOSHEN VALLEYS

By Melanie S. Elizondo

Withdrawal of water from wells in Utah and Goshen Valleys in 1983 was about 74,000 acre-feet. This was 12,000 acre-feet less than in 1982 and 27,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). Withdrawal in Utah Valley was 68,000 acre-feet or 2,700 acre-feet less than in 1982. Withdrawal in Goshen Valley was 6,000 acre-feet, or 9,600 acre-feet less than in 1982. The decrease in withdrawals mainly was due to a decrease for irrigation.

Water levels throughout Utah and Goshen Valleys generally rose from March 1983 to March 1984 (figs. 14-17). However, small declines were recorded locally in all aquifers. The rises were due to above average precipitation and decreased withdrawal from wells.

The relation of water levels in selected observation wells to precipitation, total annual withdrawal from wells, annual withdrawals for public supply, and estimated population of Utah County is shown in figure 18.

U. S. Geological Survey
in cooperation with the
Utah Department of Natural Resources,
Division of Water Rights

Water-level-change Map
Number 398

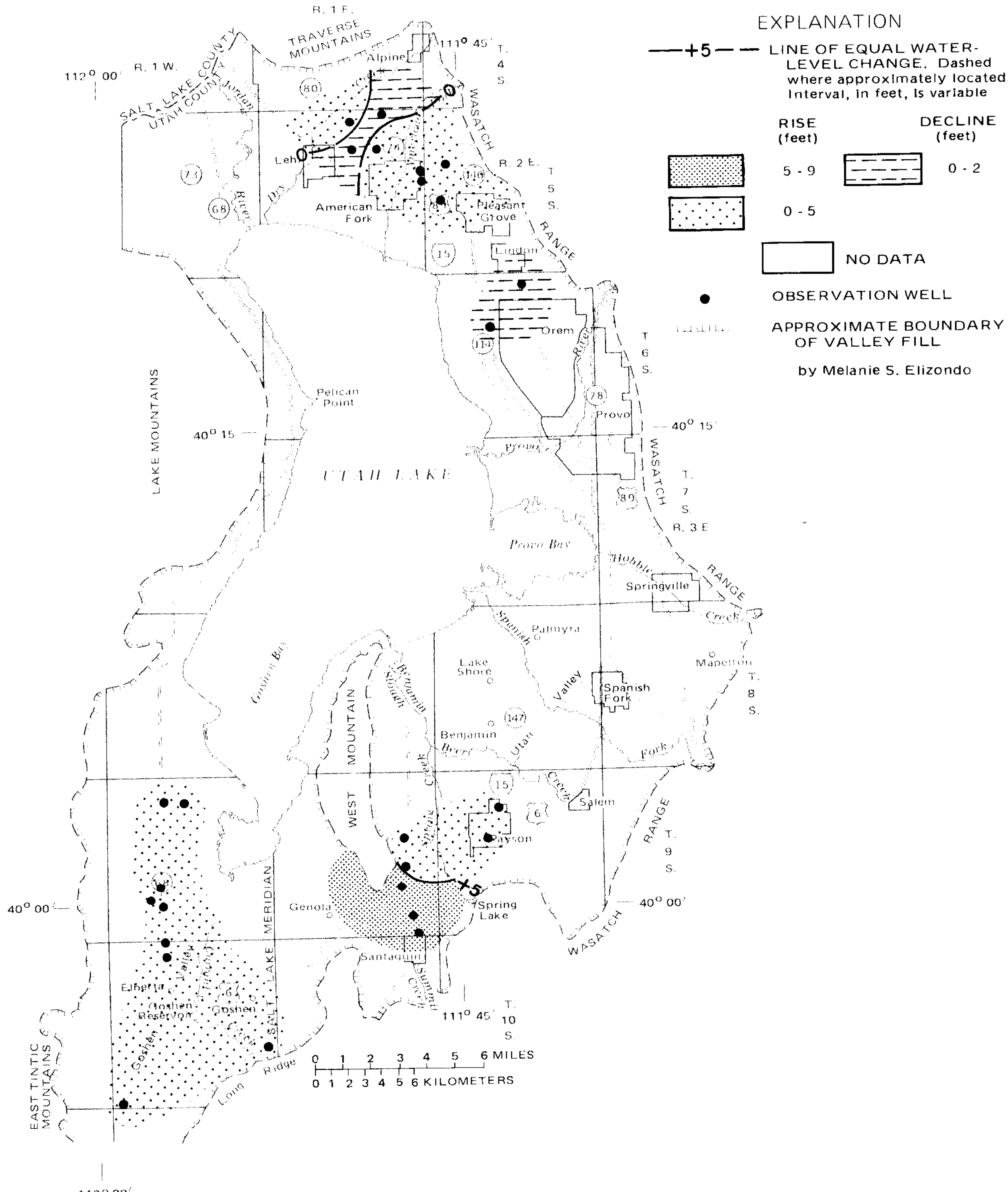

Figure 14.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1983 to March 1984.

U. S. Geological Survey
in cooperation with the
Utah Department of Natural Resources,
Division of Water Rights

Water-level-change Map
Number 397

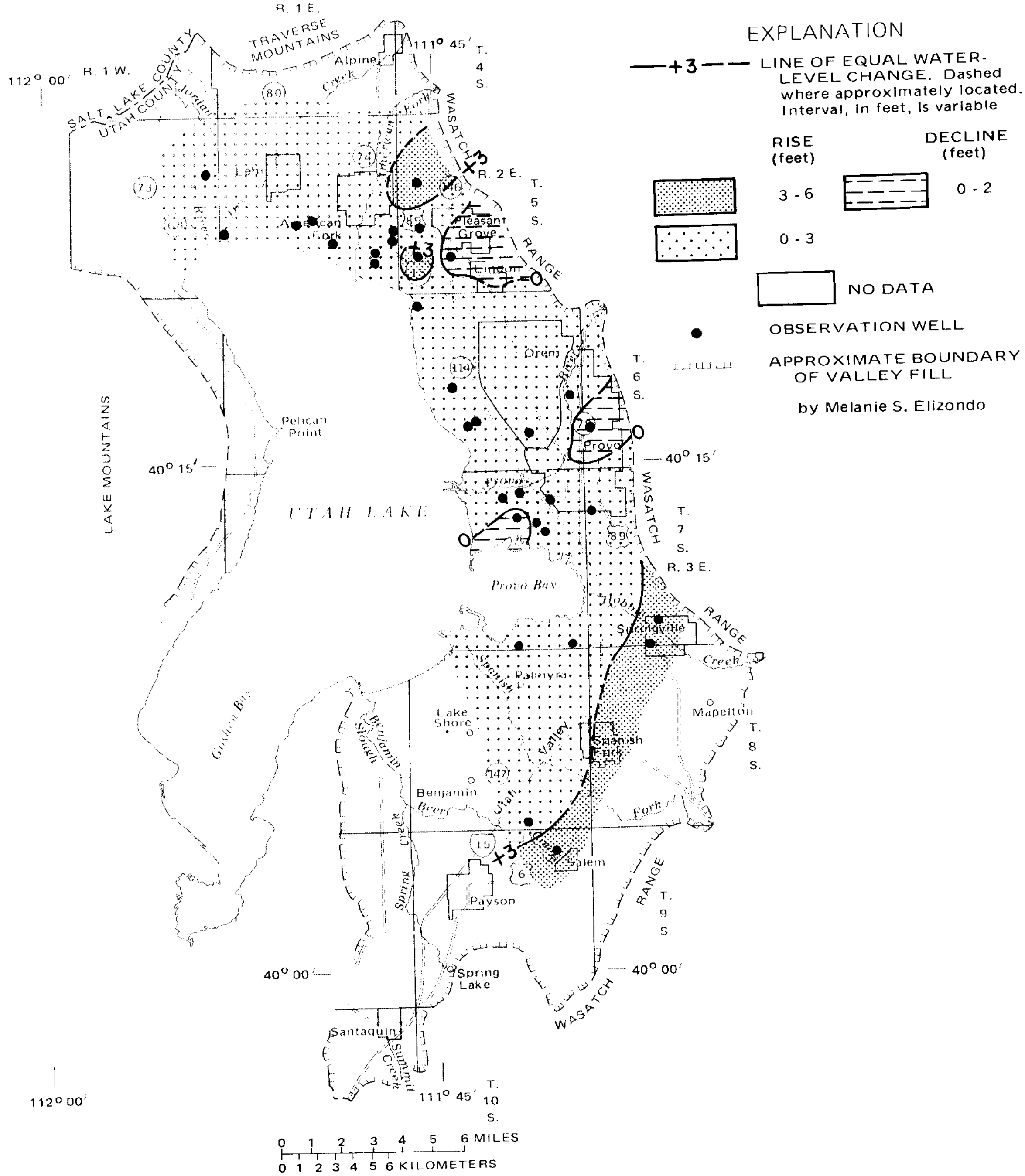

Figure 15.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in deposits of Pleistocene age from March 1983 to March 1984.

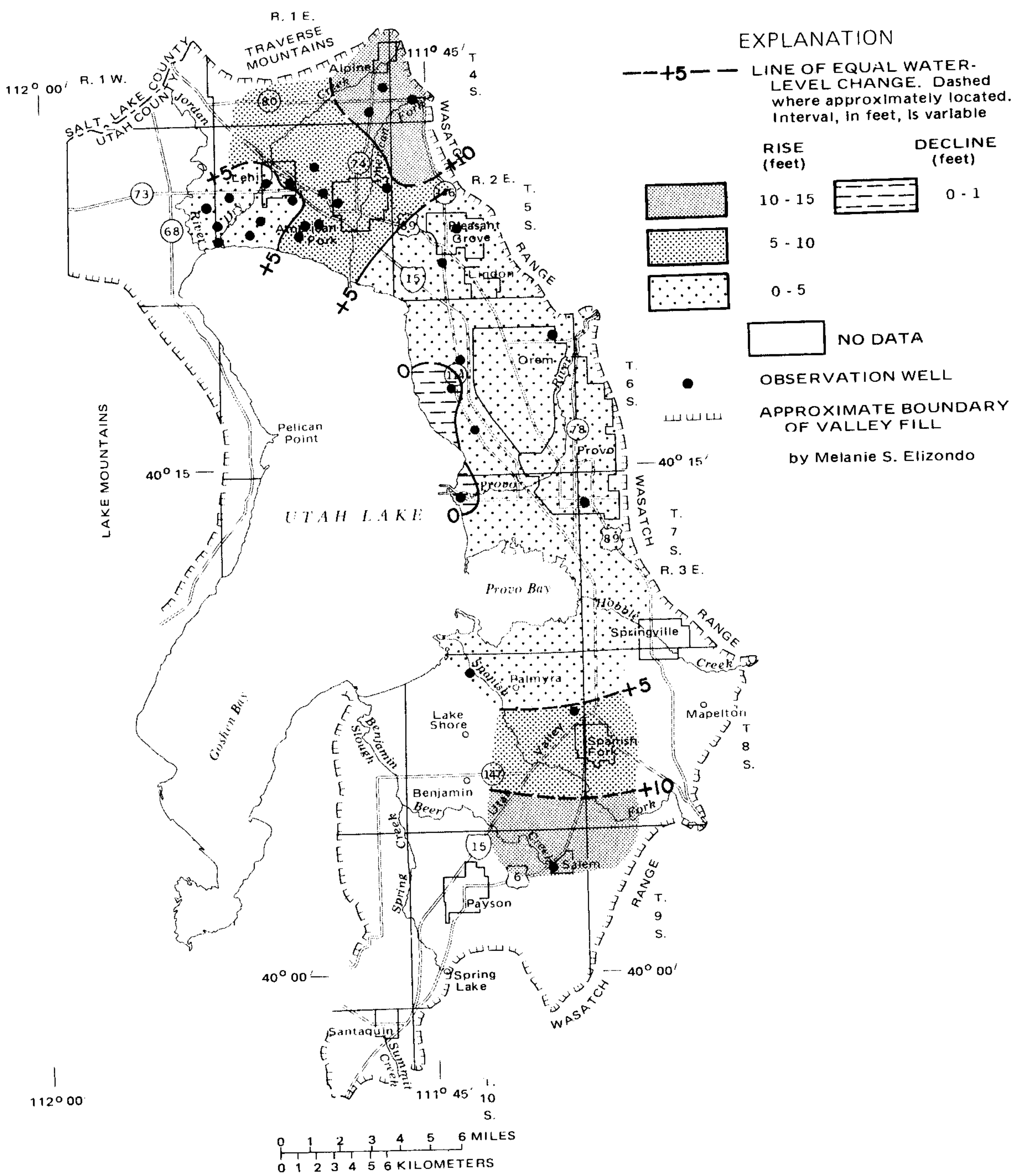

Figure 16.—Map of Utah Valley showing change of water levels in the deep artesian aquifer in deposits of Pleistocene age from March 1983 to March 1984.

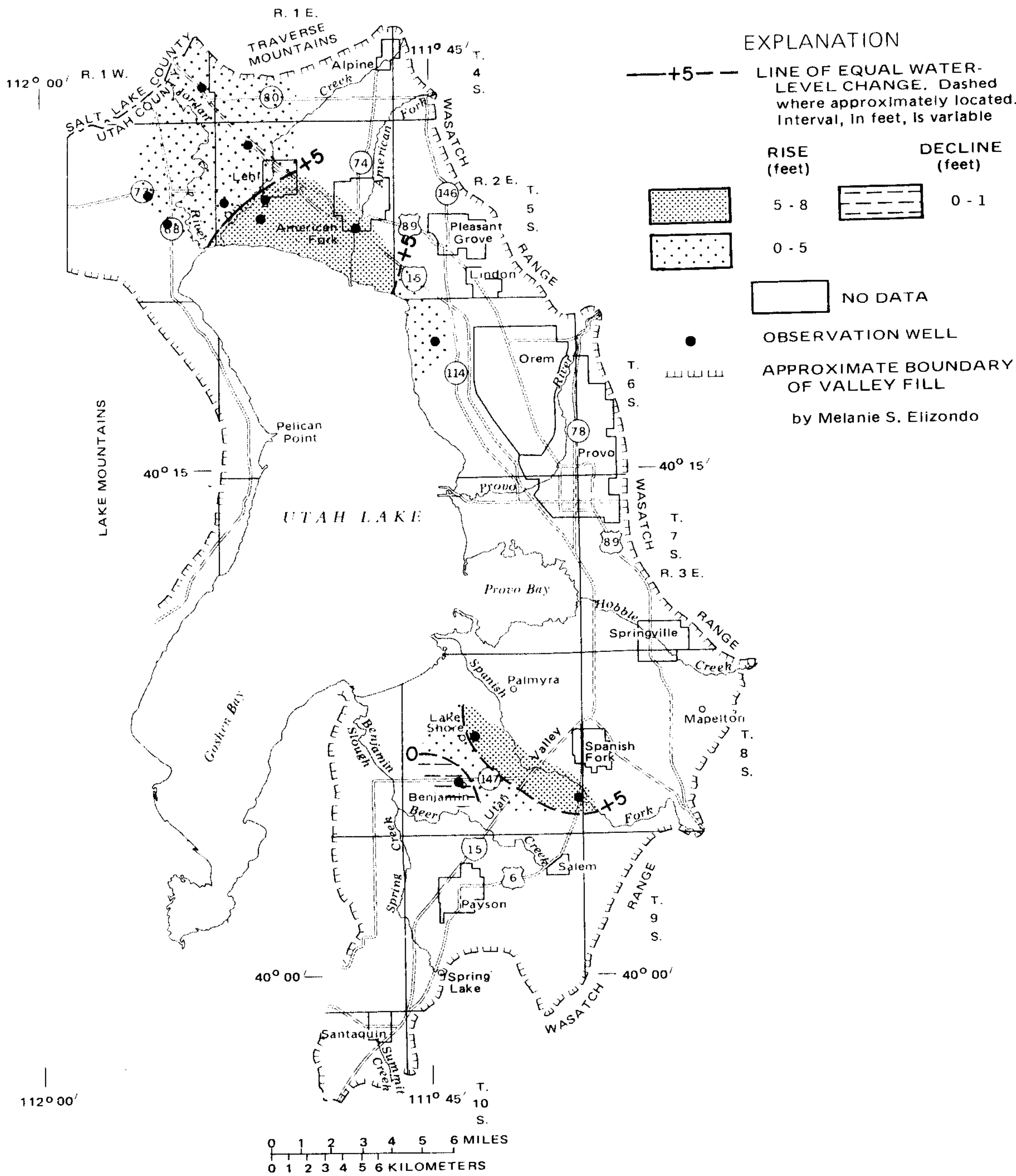

Figure 17.—Map of Utah Valley showing change of water levels in the artesian aquifer in deposits of Quaternary or Tertiary age from March 1983 to March 1984.

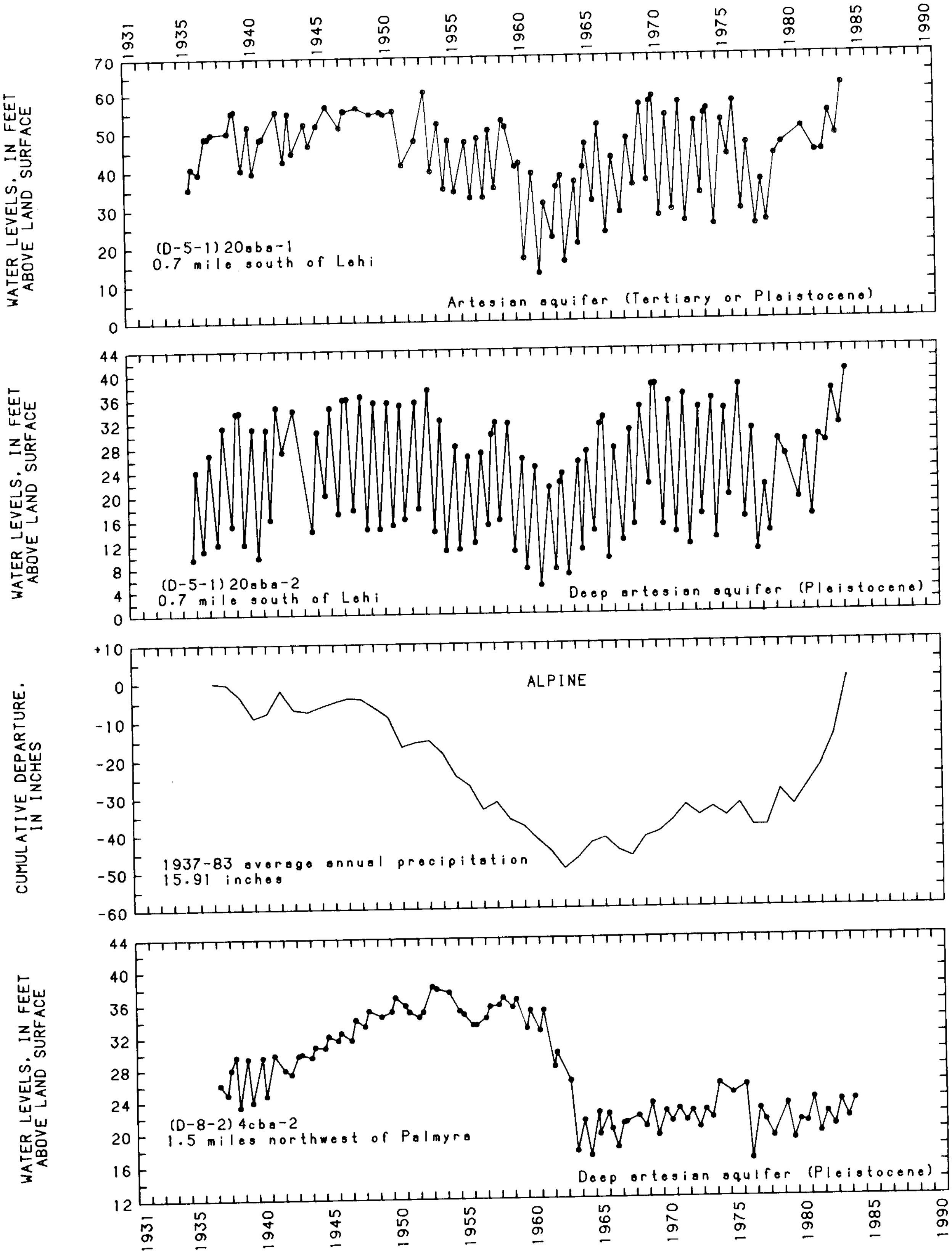

Figure 18.—Relation of water levels in selected wells to cumulative departure from the average annual precipitation at Alpine and Spanish Fork Powerhouse, and total annual withdrawals from wells and annual withdrawals for public supply in Utah and Goshen Valleys, and estimated population of Utah County.

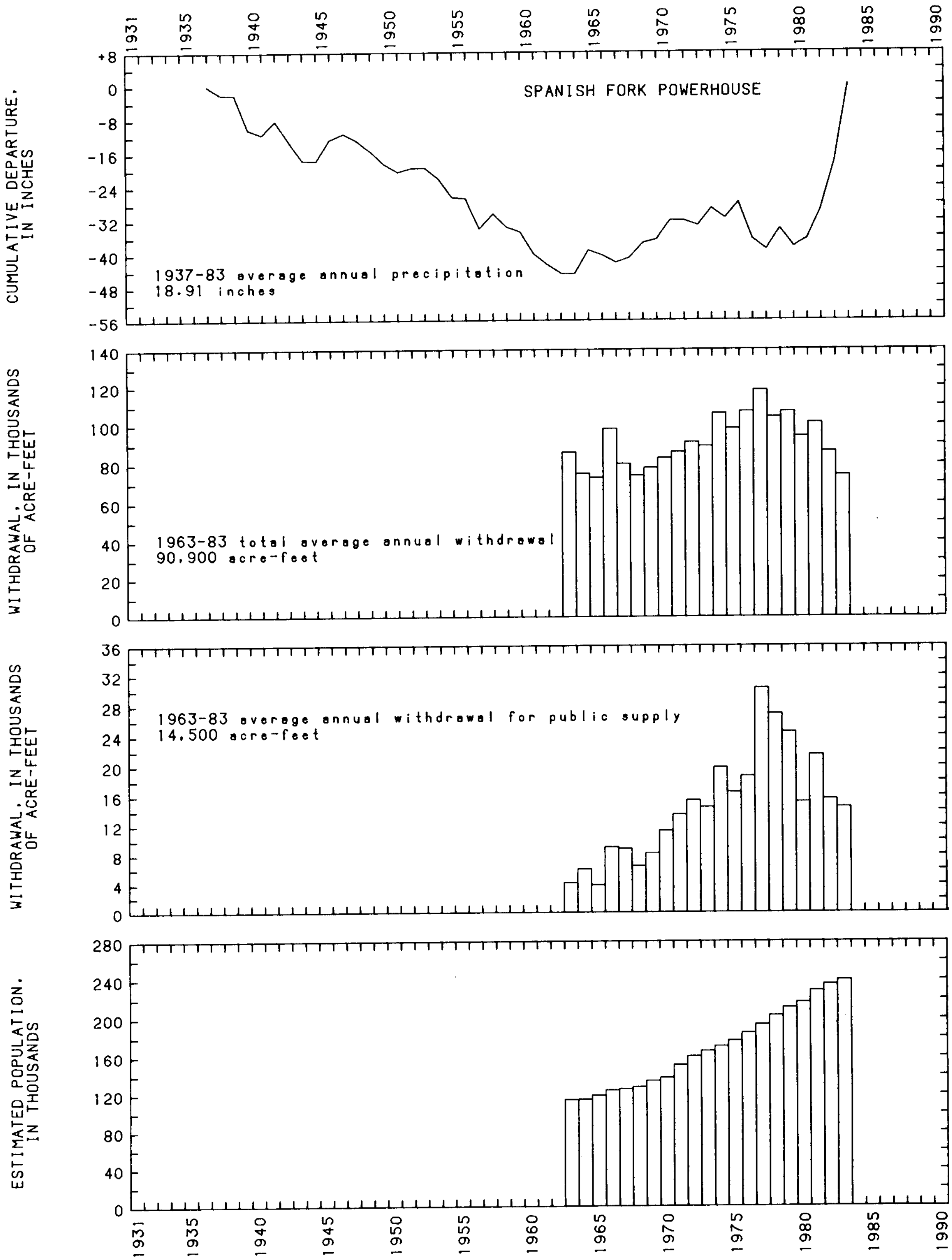

Figure 18.—Continued

JUAB VALLEY

By V. L. Jensen

Withdrawal of water from wells in Juab Valley during 1983 was about 6,000 acre-feet. This was 10,000 acre-feet less than reported for 1982 and 16,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease in withdrawal was due mostly to the increased amount of surface water available for irrigation, and possibly partly because of higher costs of power for pumping.

Water levels rose throughout most of the valley from March 1983 to March 1984 (fig. 19). The largest measured rise of 36.1 feet was in the Levan area. The water-level rise was the largest rise recorded in Utah for March 1983 to March 1984. The rises probably were due to recharge from above average precipitation and decreased withdrawal from wells.

The relation of water levels in two observation wells, annual withdrawals from wells, and cumulative departure from the average annual precipitation for 1935-83 at Nephi is shown in figure 20. Precipitation at Nephi during 1983 was 26.52 inches, which is 12.33 inches above the average annual precipitation for 1935-83.

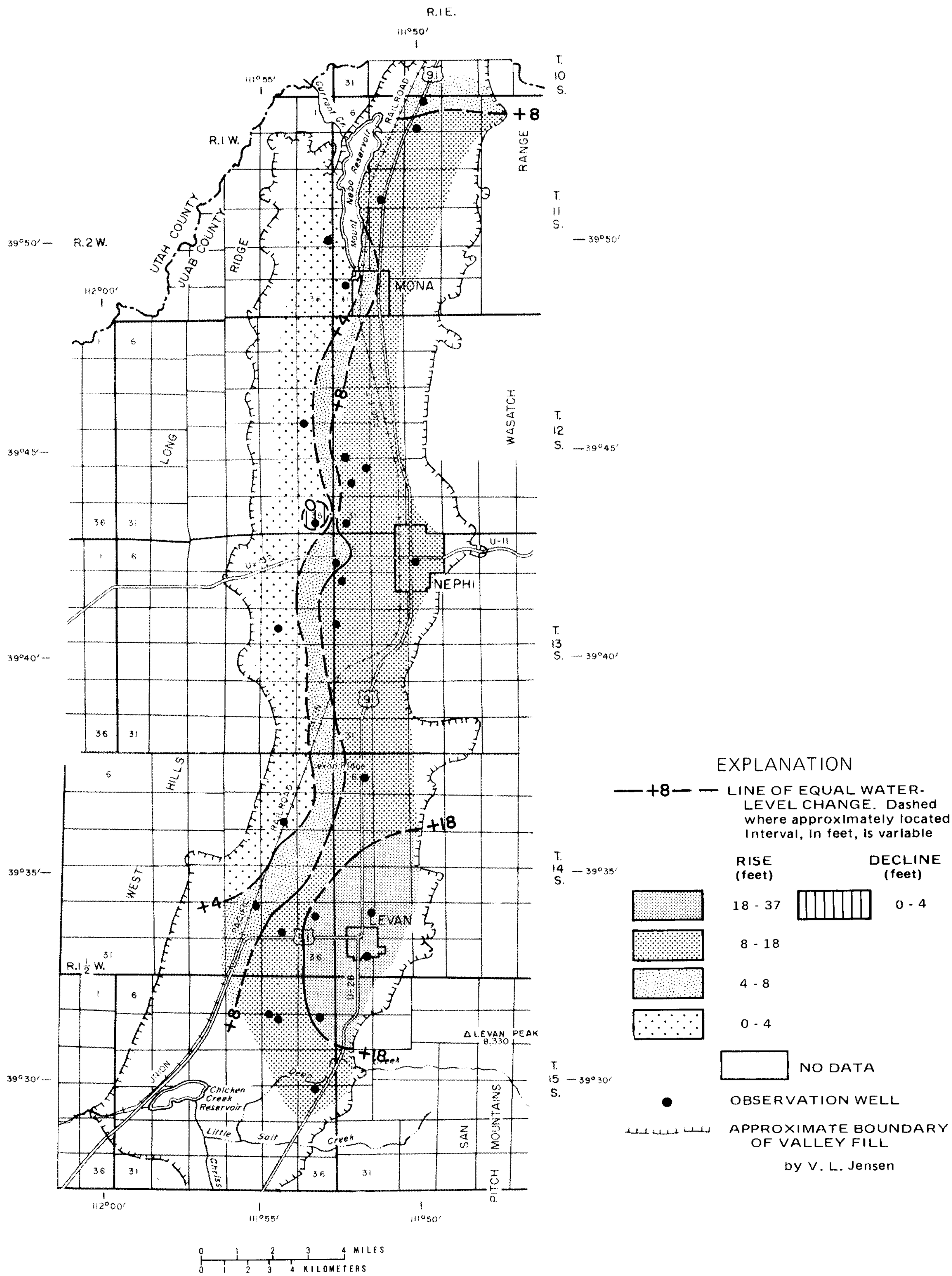

Figure 19.—Map of Juab Valley showing change of water levels from March 1983 to March 1984.

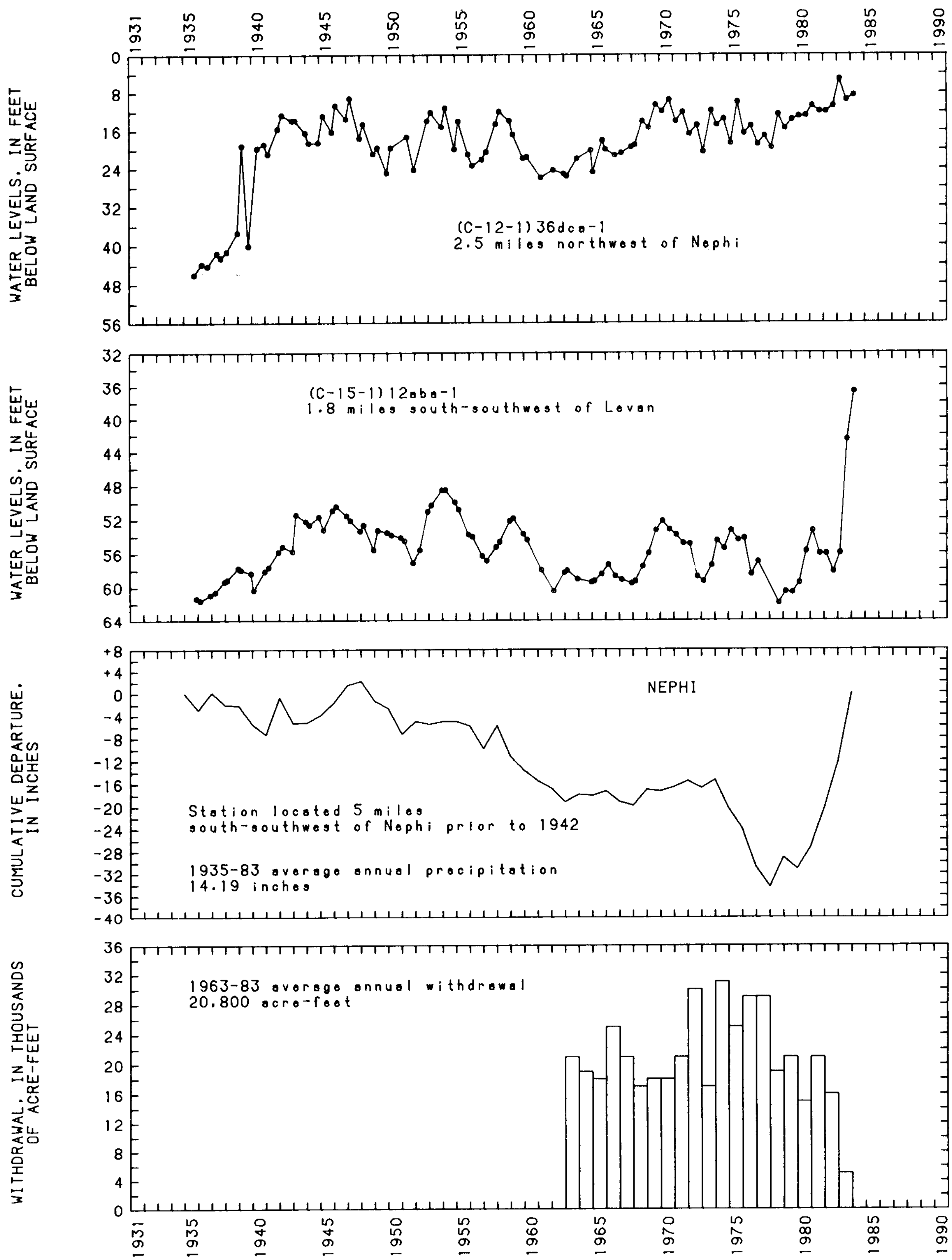

Figure 20.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi and to annual withdrawals from wells.

SEVIER DESERT

By Michael Enright

Withdrawal of water from wells in the Sevier Desert in 1983 was about 8,000 acre-feet. This was 8,000 acre-feet less than was reported for 1982 and about 21,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The relatively small withdrawal during 1983 was due to the availability of above normal supplies of surface water for irrigation. During 1983, the Sevier River near Juab discharged 918,900 acre-feet (fig. 21). This is 736,400 acre-feet more than the 1982 discharge, and about 760,000 acre-feet more than the average annual discharge for 1935-83.

In those parts of the Sevier Desert where observation wells are located, water levels rose from March 1983 to March 1984 in more than 95 percent of the upper artesian aquifer and throughout the lower artesian aquifer (figs. 22 and 23). The largest observed water-level rise in both the upper and lower artesian aquifers was 18.2 feet along the eastern edge of the Sevier Desert. These rises can be attributed to the continued increase in recharge by streamflow from the Canyon Mountains and above average availability of surface water for irrigation that resulted in below average ground-water withdrawals. The only observed water-level declines, less than 1 foot, were in the upper artesian aquifer in the Hinkley area and southeast of Delta.

The long-term relation of precipitation at Oak City, discharge of the Sevier River near Juab, water levels in selected wells, and annual withdrawals from wells is shown in figure 21. Precipitation at Oak City in 1983 was 20.23 inches, 7.53 inches above the average annual precipitation for 1935-83.

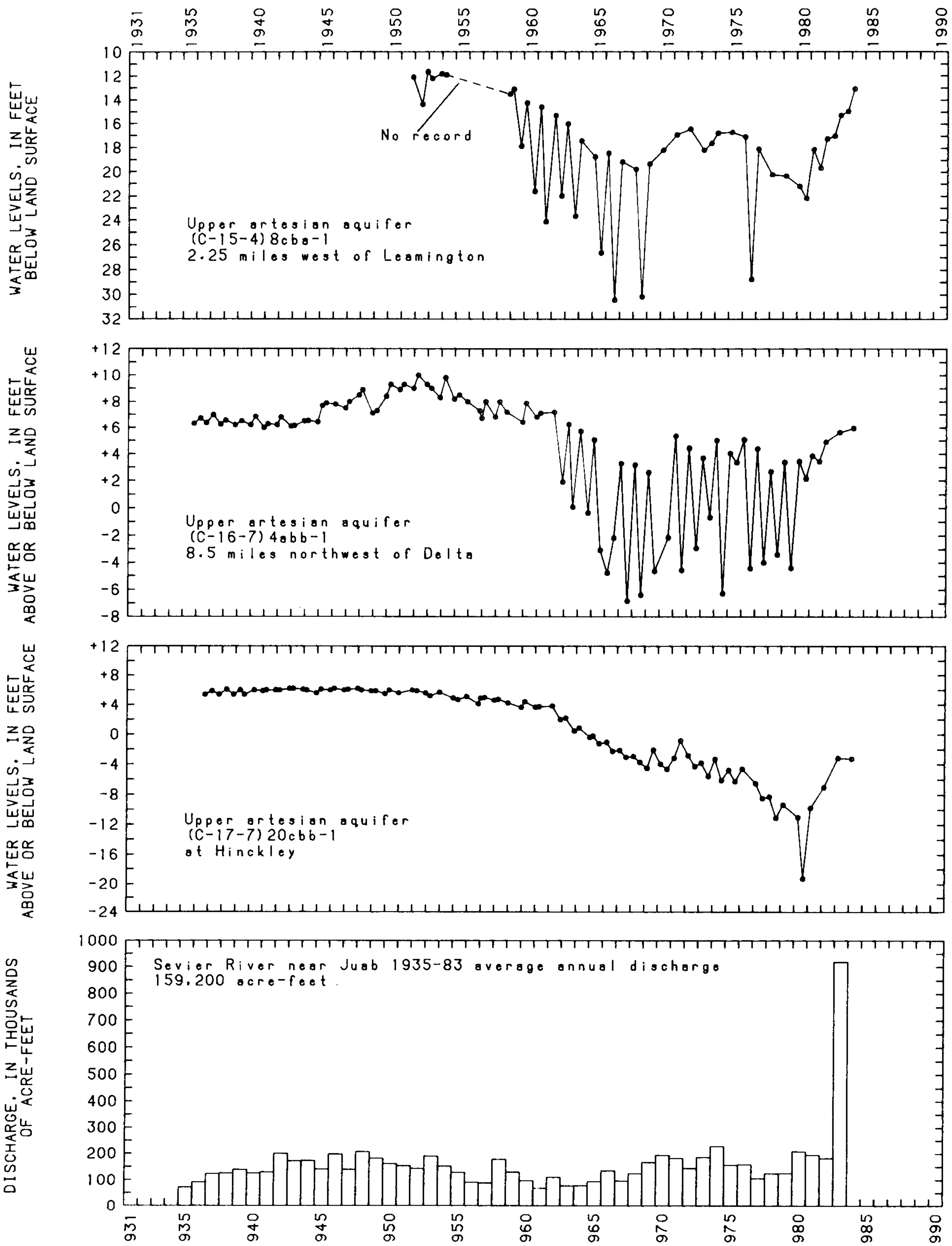

Figure 21.—Relation of water levels in selected wells in the Sevier Desert to discharge of the Sevier River near Juab, to cumulative departure from the average annual precipitation at Oak City, and to annual withdrawals from wells.

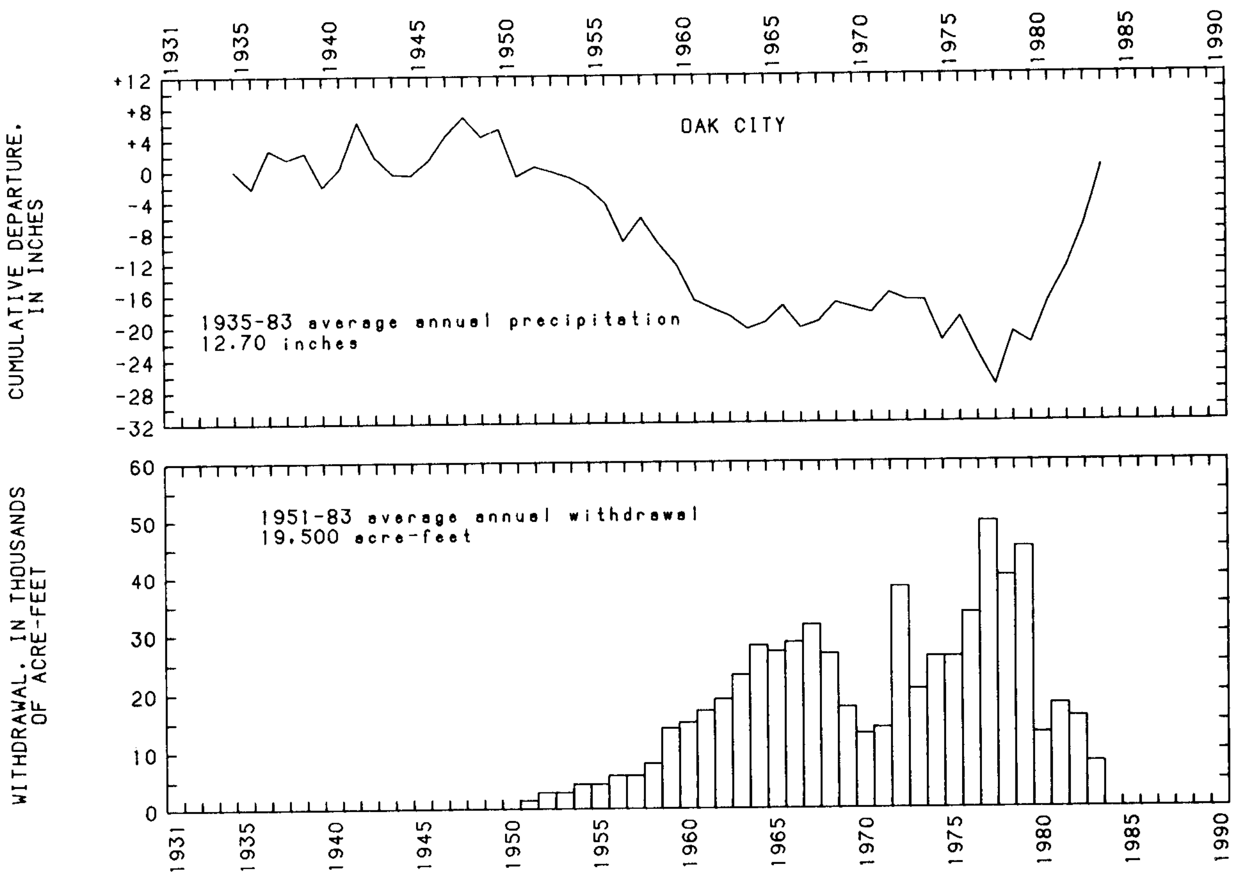

Figure 21.—Continued

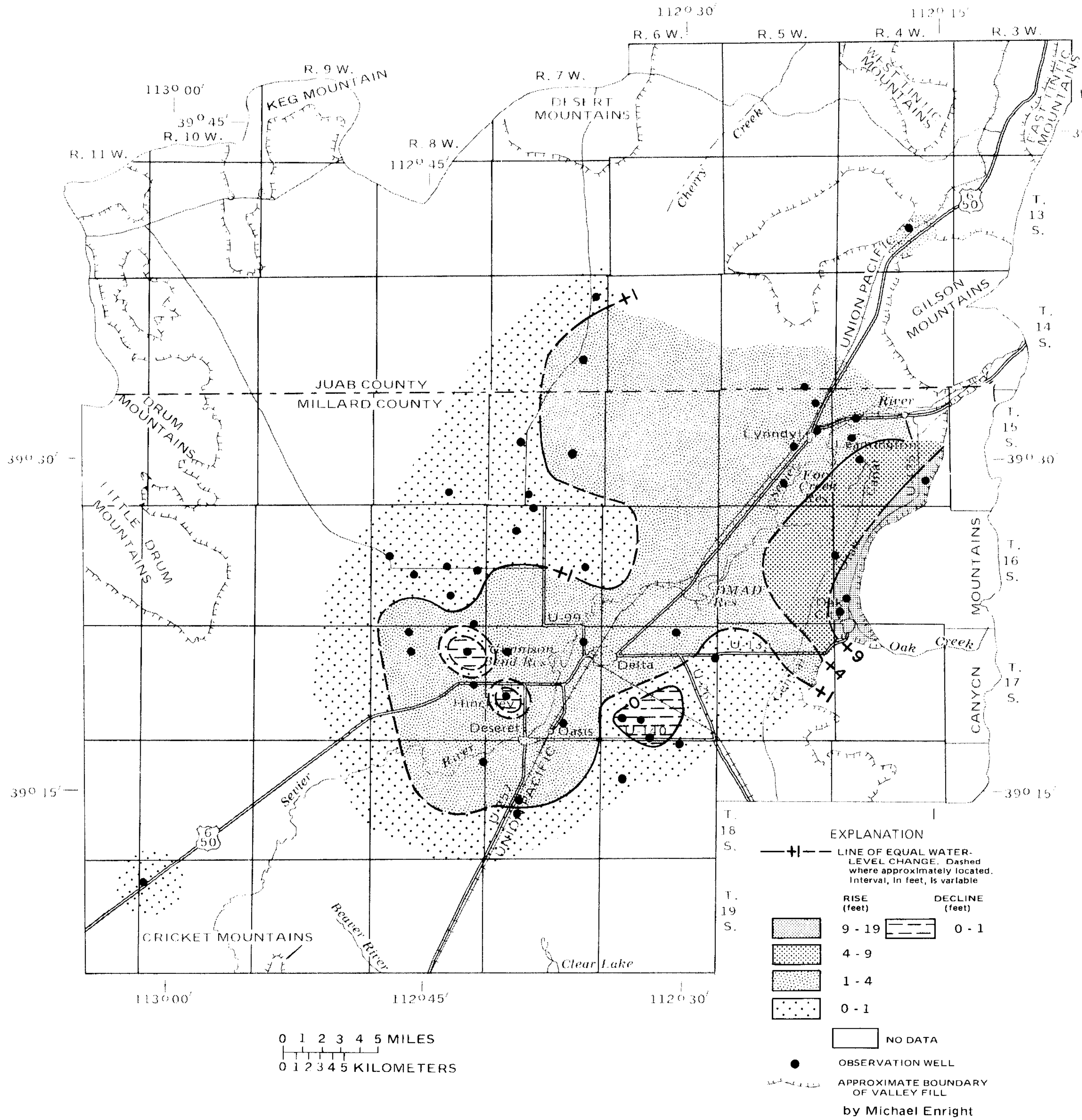

Figure 22.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1983 to March 1984.

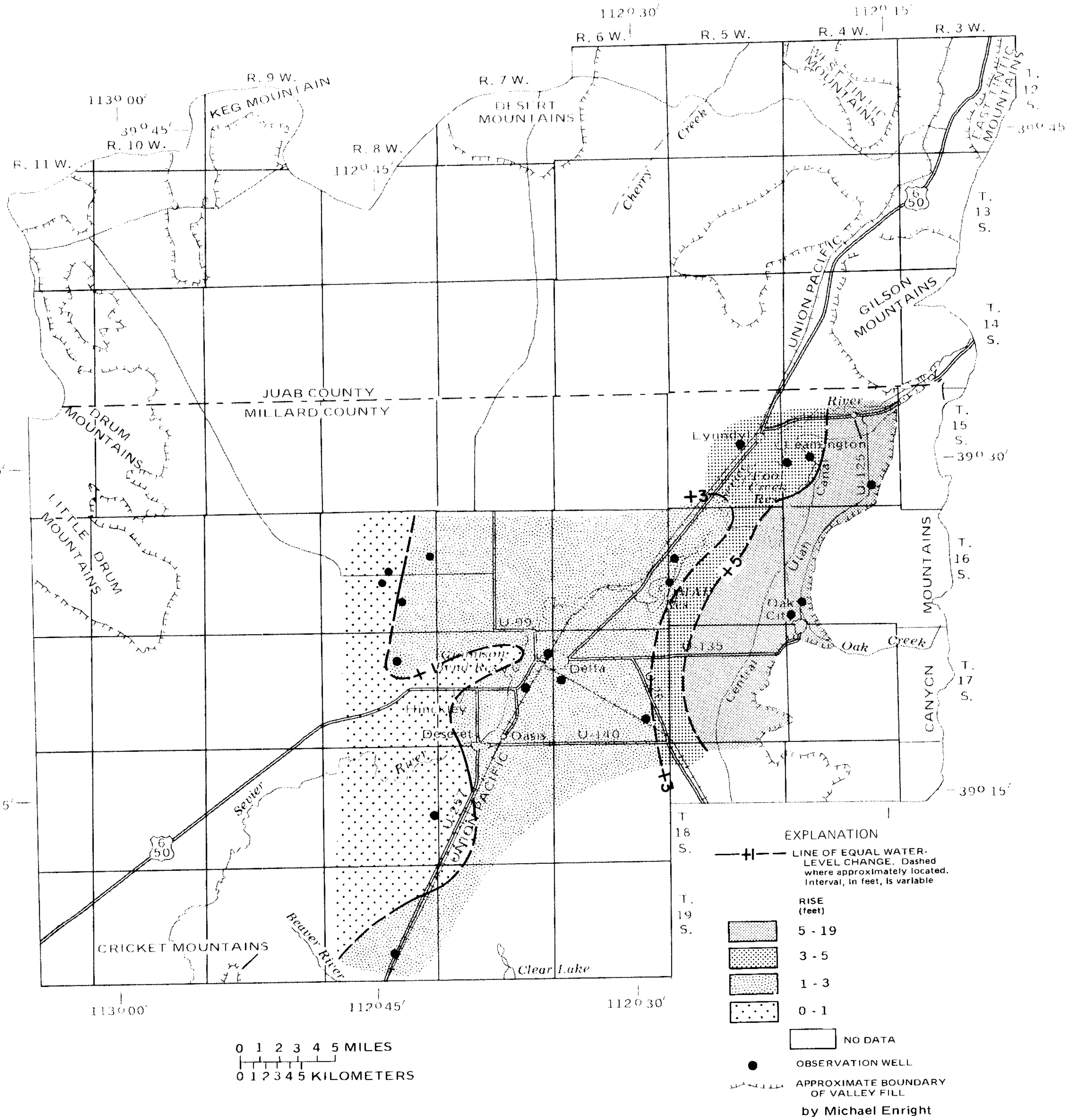

Figure 23.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1983 to March 1984.

UPPER AND CENTRAL SEVIER VALLEYS AND UPPER FREMONT RIVER VALLEY

By D. C. Emett

Withdrawal of water from wells in the upper and central Sevier Valleys and upper Fremont River valley was approximately 21,000 acre-feet in 1983, 7,000 acre-feet less than in 1982 and about 3,000 less than the average annual withdrawal for 1973-82 (table 2). The overall decrease was caused mostly by smaller withdrawals for irrigation and public supply, which resulted from increased availability of surface water due to increased precipitation.

Water levels rose from March 1983 to March 1984 in 19 of 28 observation wells (fig. 24). The largest observed water-level rise was 8.2 feet in a well northeast of Richfield, near the Sevier River. Rises probably were due to above average streamflow and local decreased withdrawals from wells. Water levels declined in the other nine observation wells. The largest observed water-level decline, 4.5 feet, was in a well at the Otter Creek Reservoir campground. The decline probably resulted from the lowering of the reservoir in preparation for spring runoff.

The relation of water levels in selected wells to discharge of the Sevier River at Hatch, and precipitation at Panguitch, Salina, and Loa is shown in figure 25. Precipitation was above average at all three stations and the discharge of the Sevier River at Hatch was 189,000 acre-feet, more than double the average for 1940-83.

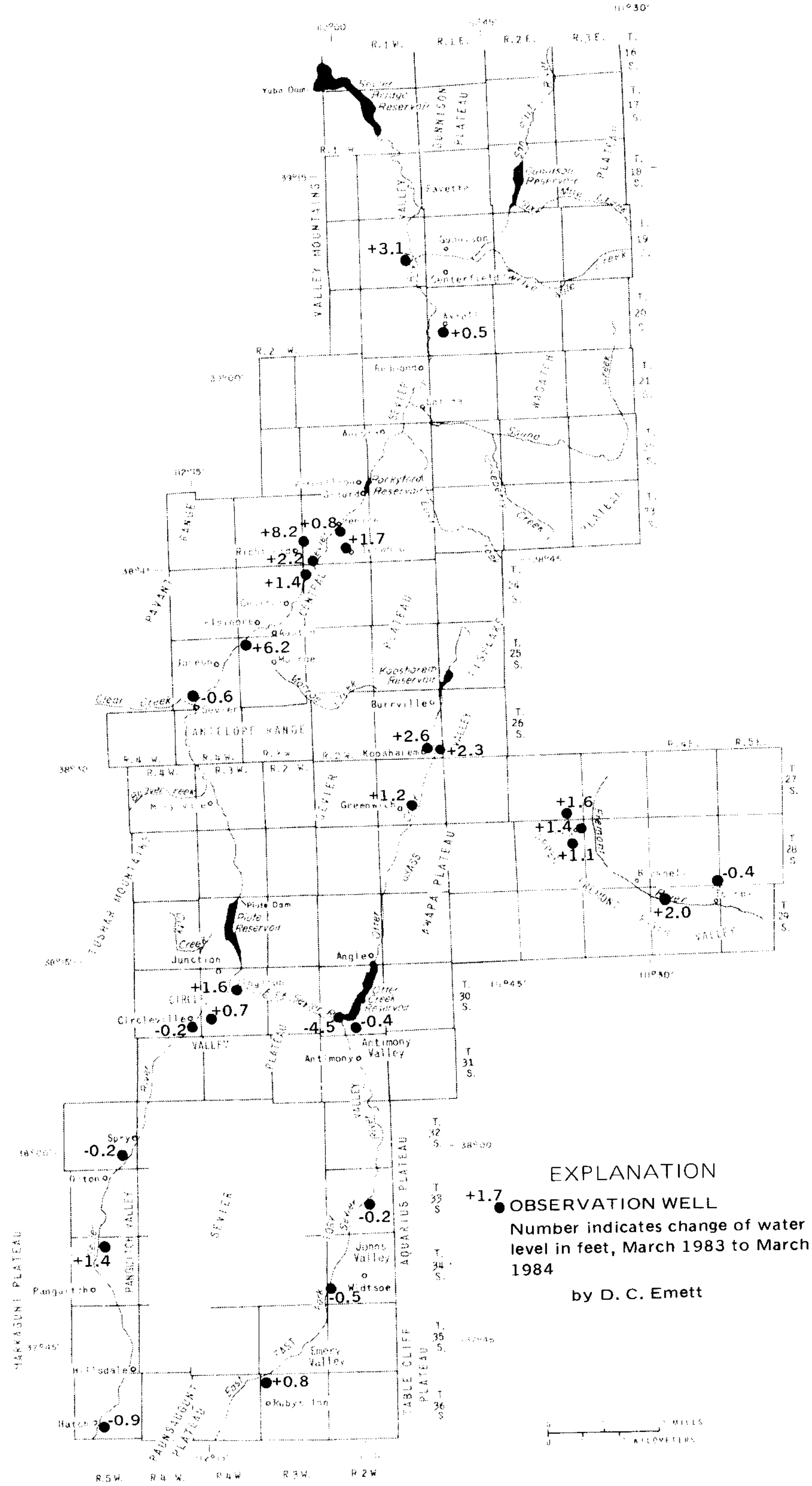

Figure 24.—Map of the upper and central Sevier River Valleys and upper Fremont River valley showing change of water levels from March 1983 to March 1984.

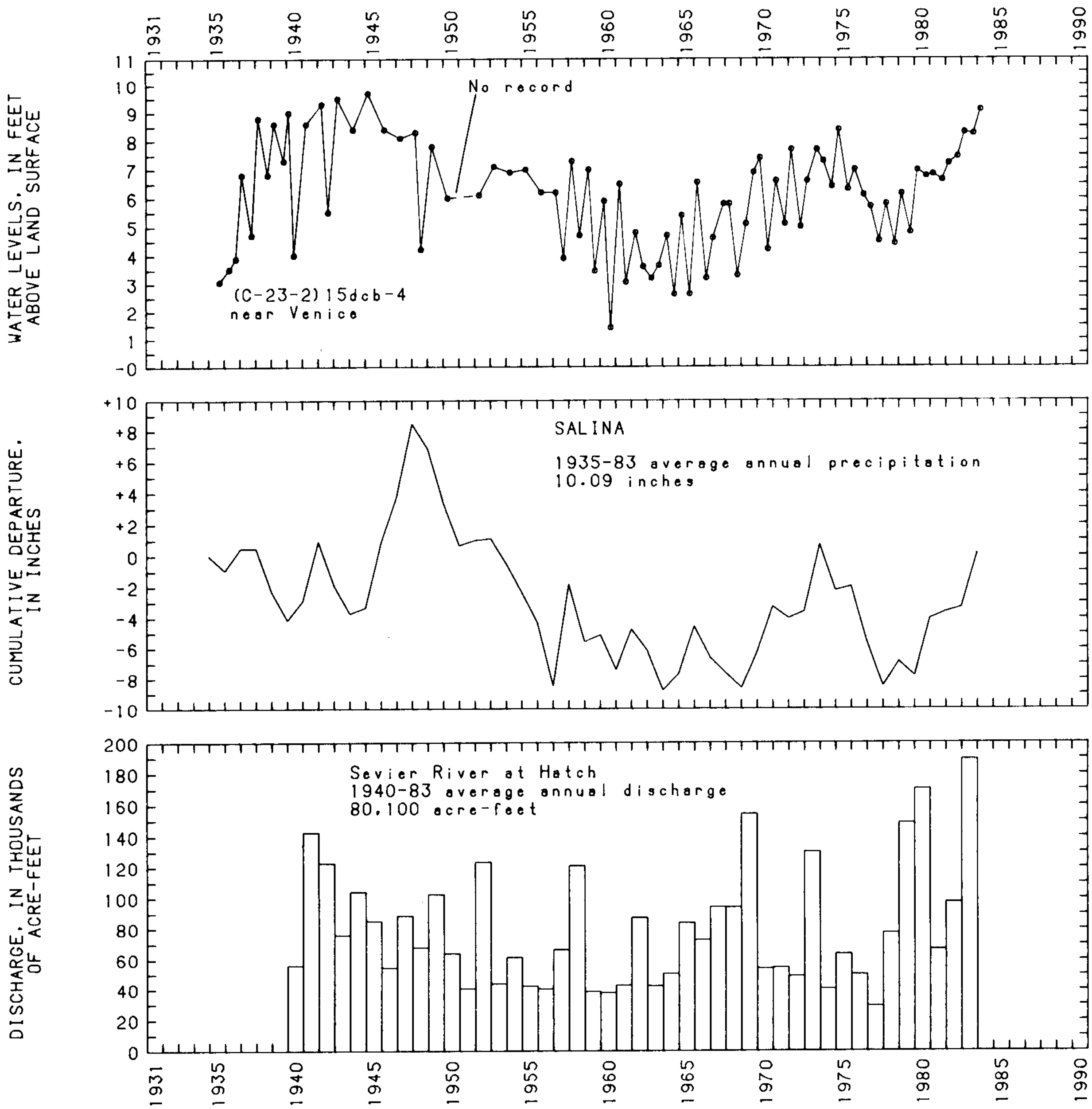

Figure 25.—Relation of water levels in selected wells to discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at selected climate stations, and to annual withdrawal from wells--upper and central Sevier Valleys and upper Fremont River valley.

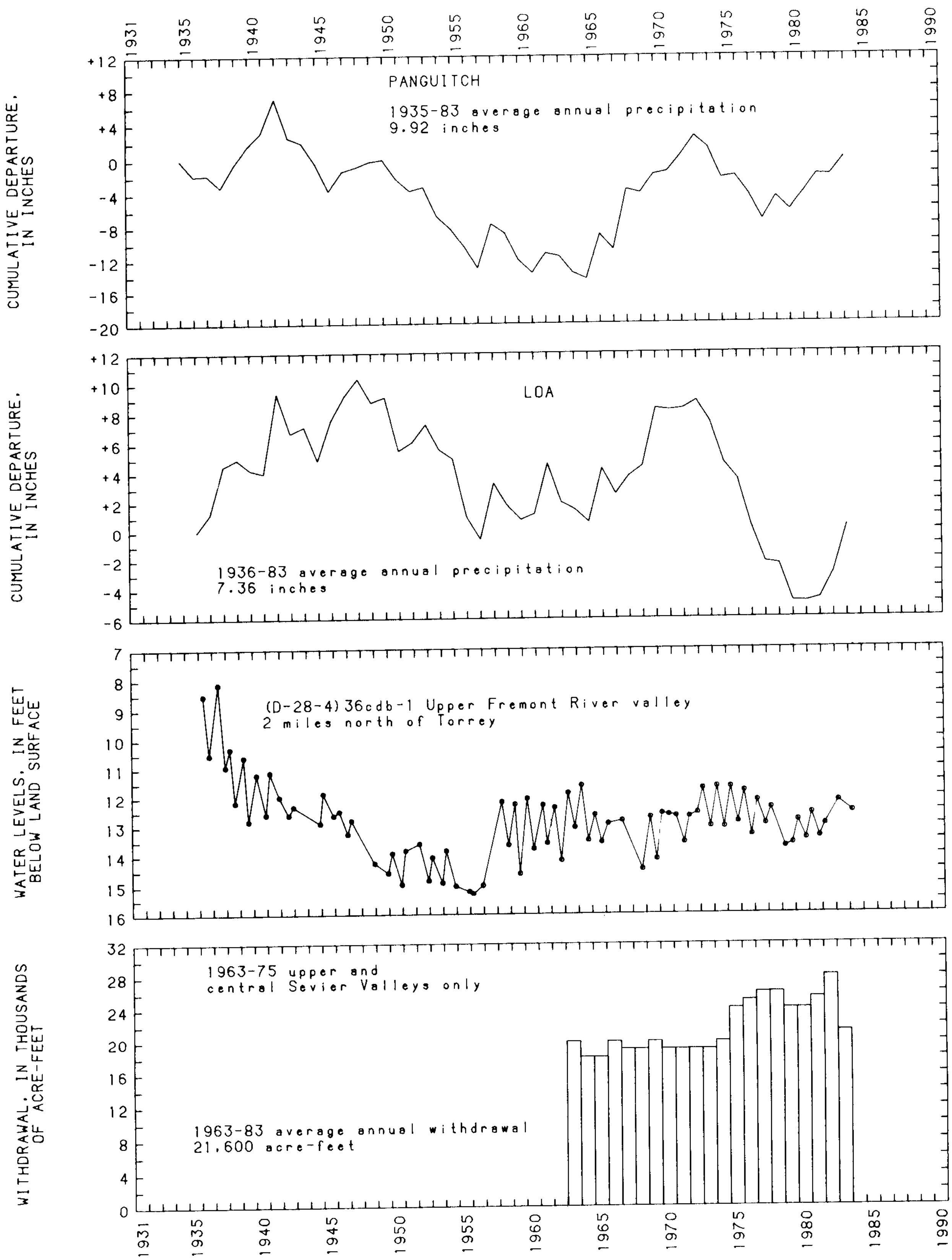

Figure 25.—Continued

PAVANT VALLEY

By Carole Burden

Withdrawal of water from wells in Pavant Valley in 1983 was 42,000 acre-feet, which was 27,000 acre-feet less than reported for 1982 and 46,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The change from 1982 to 1983 mainly was due to decreased withdrawal for irrigation.

Water levels in all observation wells rose from March 1983 to March 1984 (fig. 26), with a maximum observed rise of 32.5 feet in a well near Hatton. The rises were due to above average precipitation and decreased withdrawal for irrigation.

The long-term relation of precipitation at Fillmore, water levels in selected observation wells, and annual withdrawals from wells are shown in figure 27. Precipitation at Fillmore in 1983 was 25.33 inches, which is 10.51 inches above the average annual precipitation for 1931-83 (fig. 27).

Concentrations of dissolved solids in water from selected wells in Pavant Valley are shown in figure 28. As shown, concentrations in the ground water increased from 1982 to 1983 at well (C-23-5)5acd-1. The observed dissolved-solids concentration for a water sample obtained from that well was 549 milligrams per liter, the greatest concentration observed during 23 years of record.

Samples were not collected at well (C-23-6)8abd-1 because it was not pumped during 1983 and at wells (C-21-5)7cdd-2 and (C-23-6)21bdd-1 because they were not found pumping during the summer sampling period.

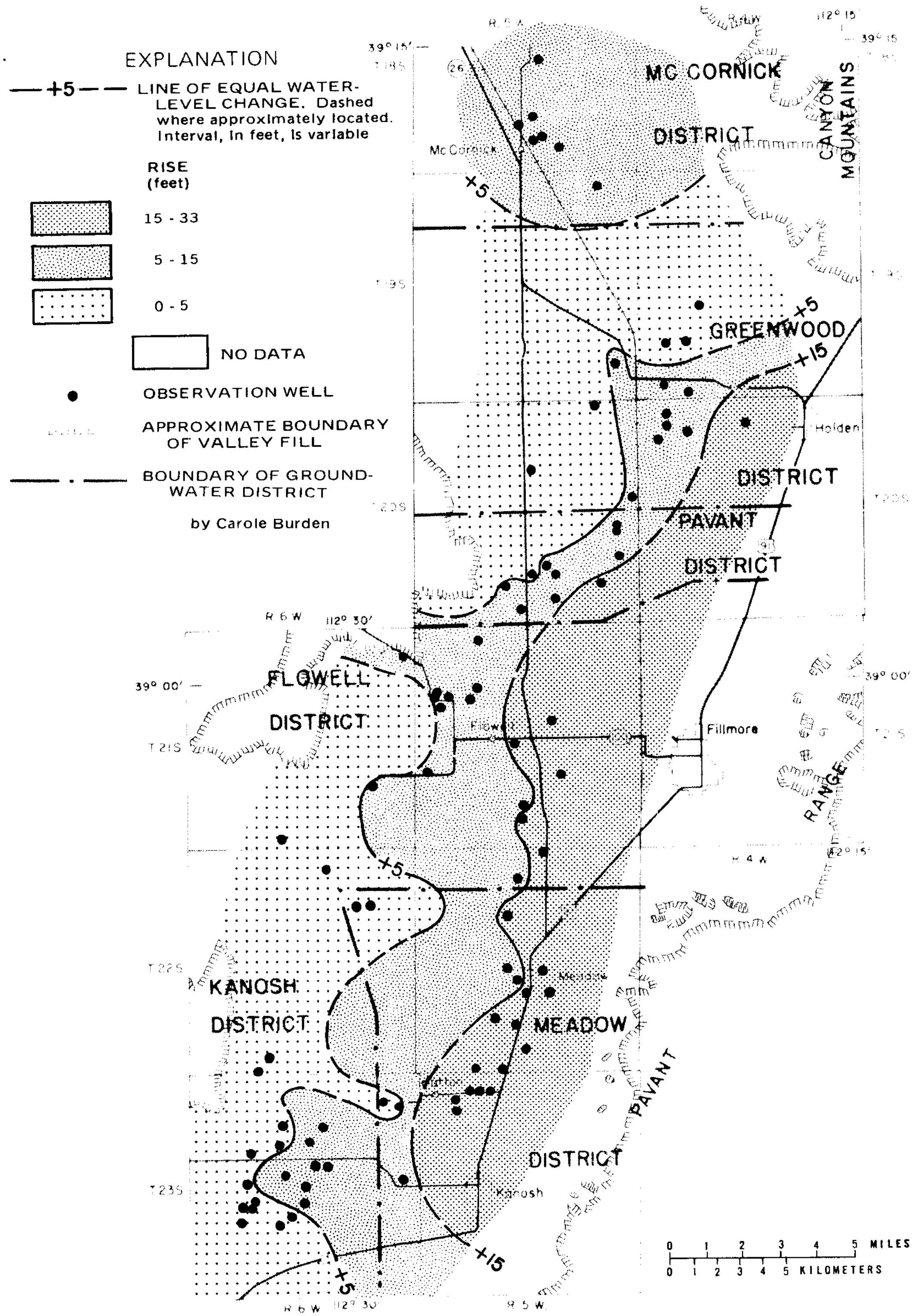

Figure 26.—Map of Pavant Valley showing change of water levels from March 1983 to March 1984.

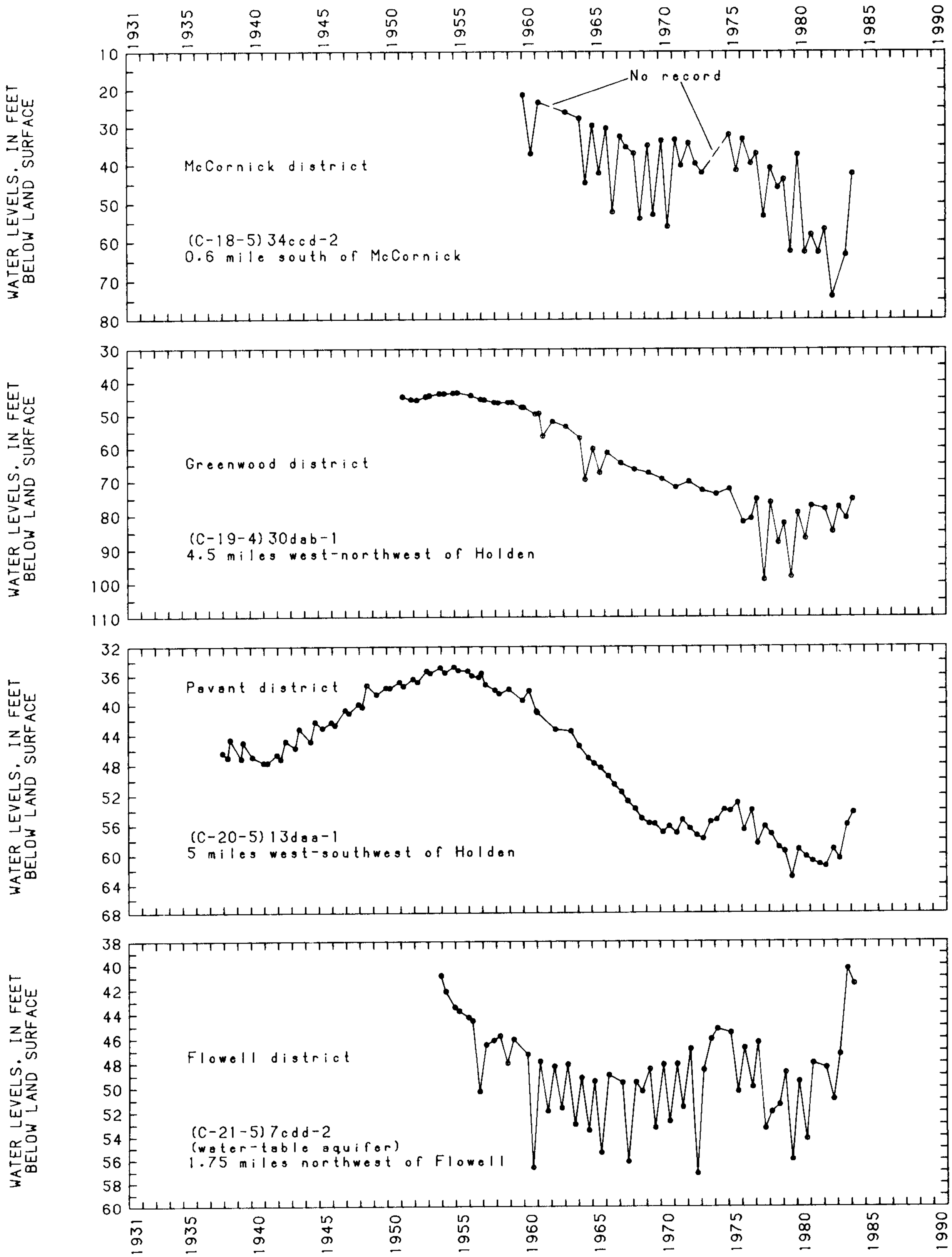

Figure 27.—Relation of water levels in selected wells in Pavant Valley to cumulative departure from average annual precipitation at Fillmore and to annual withdrawals from wells.

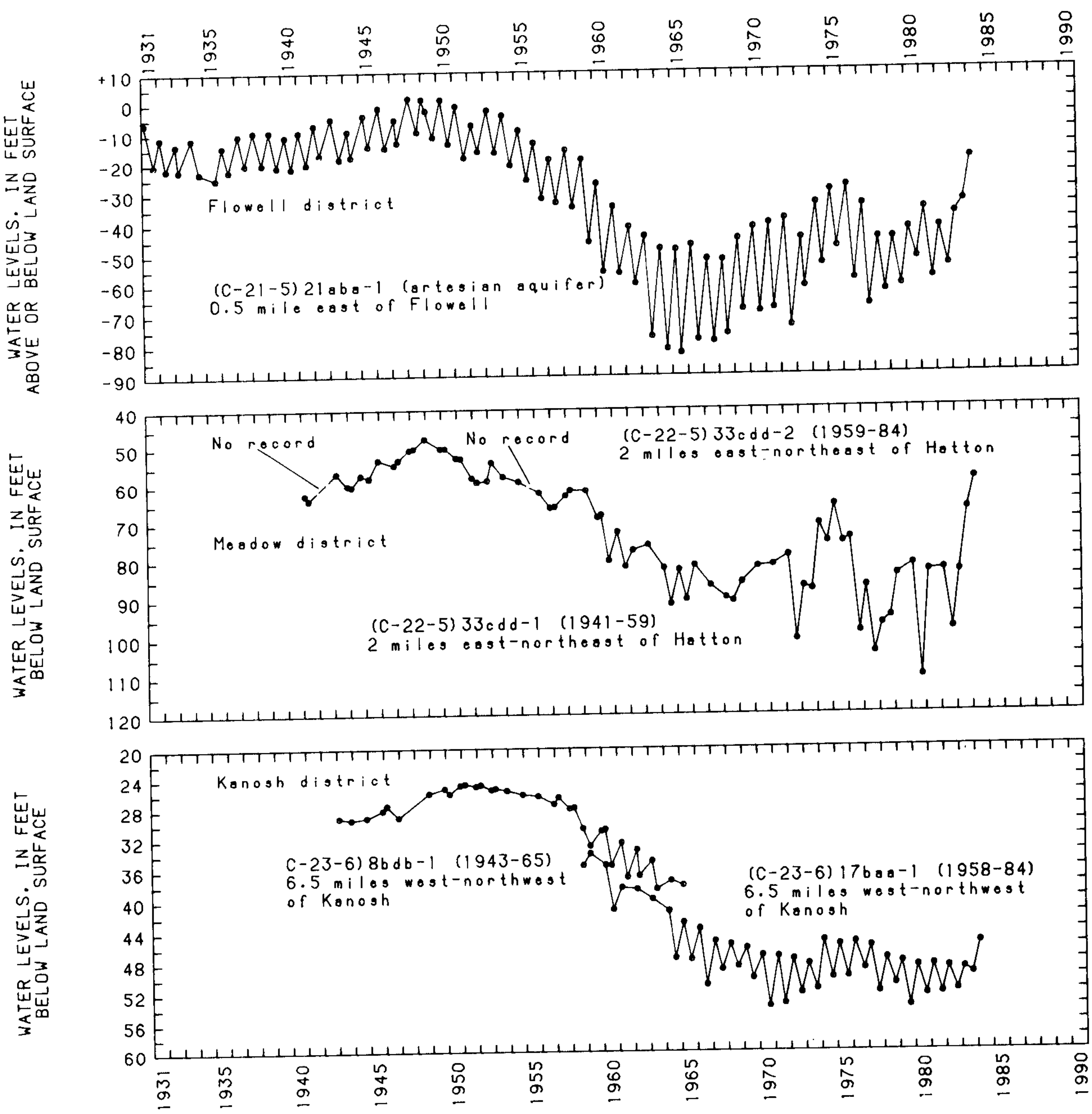

Figure 27.—Continued

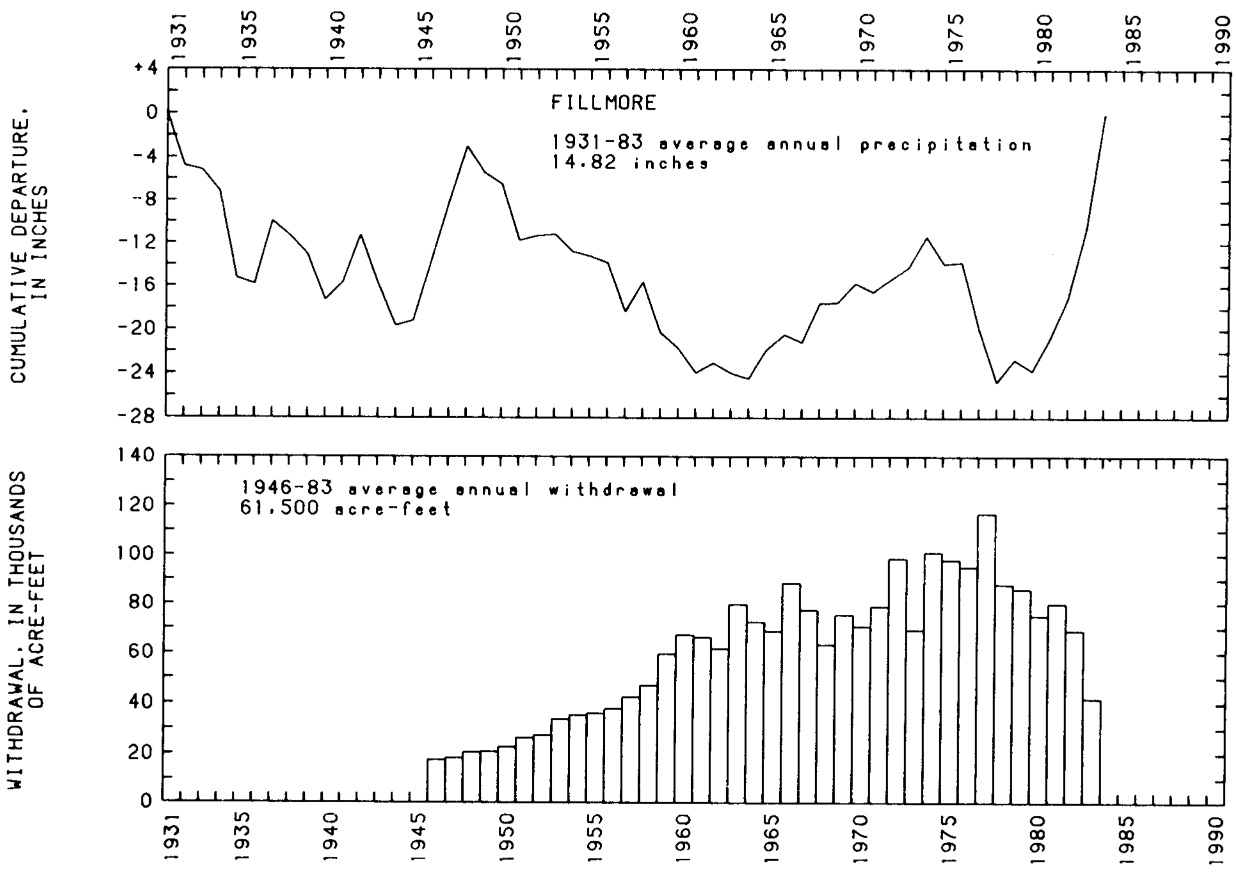

Figure 27.—Continued

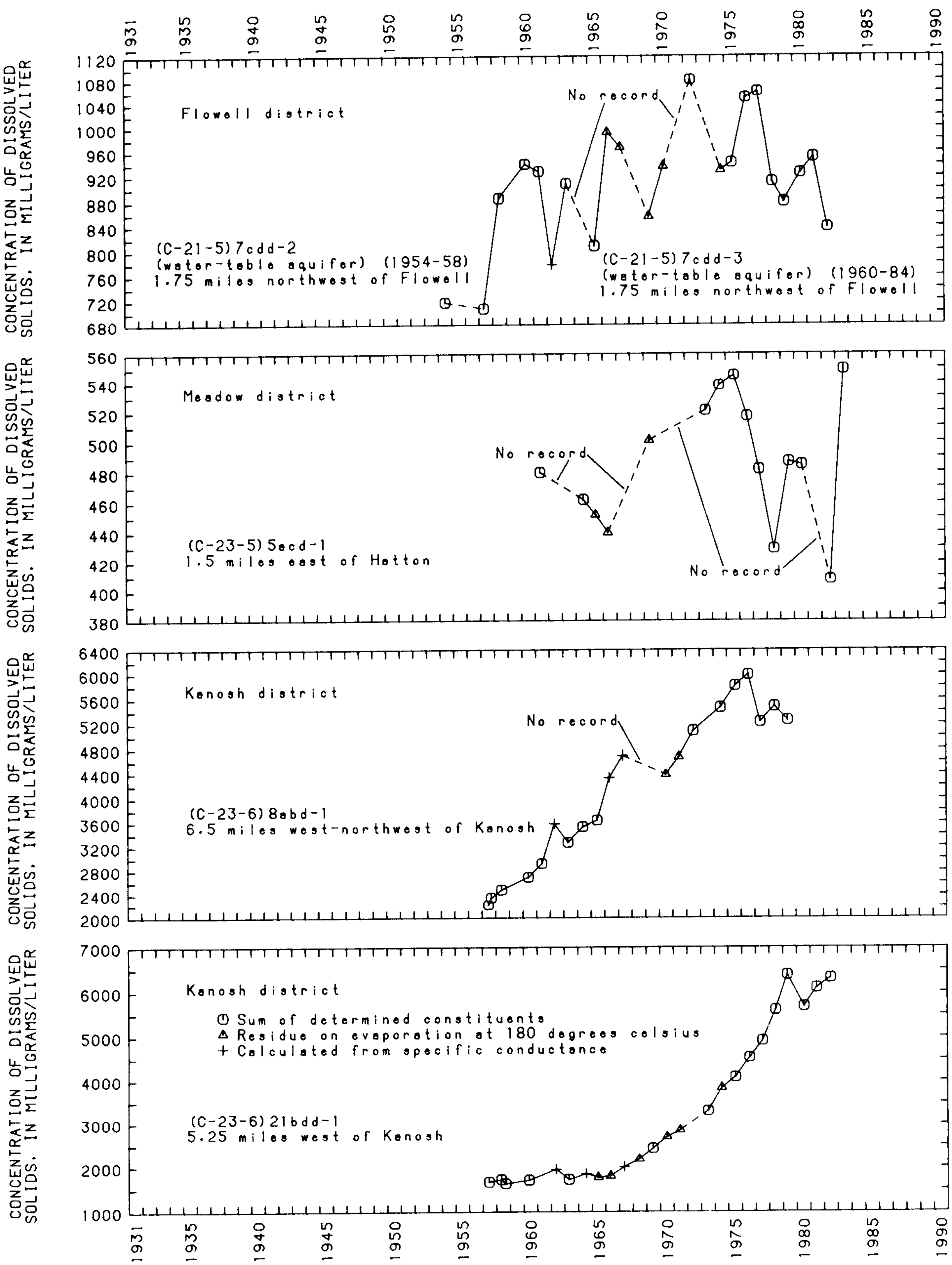

Figure 28.—Concentration of dissolved solids in water from selected wells in Pavant Valley.

CEDAR CITY VALLEY

By M. R. Eckenwiler

Withdrawal of water from wells in Cedar City Valley during 1983 was about 21,000 acre-feet, which is 7,000 acre-feet less than in 1982 and 12,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). Decreased withdrawals, mainly for irrigation, were due to increased availability of surface water in Coal Creek.

Water levels rose in most of the valley from March 1983 to March 1984 (fig. 29). The largest rises, up to 14 feet, occurred in the area northwest of Cedar City where water from Coal Creek was used for irrigation instead of ground water. Farther out in the valley, less water was available for irrigation and recharge; thus, rises were smaller. Water levels declined in only one well near the northern boundary. Discharge from Coal Creek was 64,000 acre-feet in 1983, 35,000 acre-feet more than 1982, and 40,000 acre-feet more than the average annual discharge for 1939-83.

The relation of water levels in well (C-35-11)33aac-1 to precipitation at Cedar City Airport, discharge of Coal Creek, and annual withdrawals of water from wells is shown in figure 30.

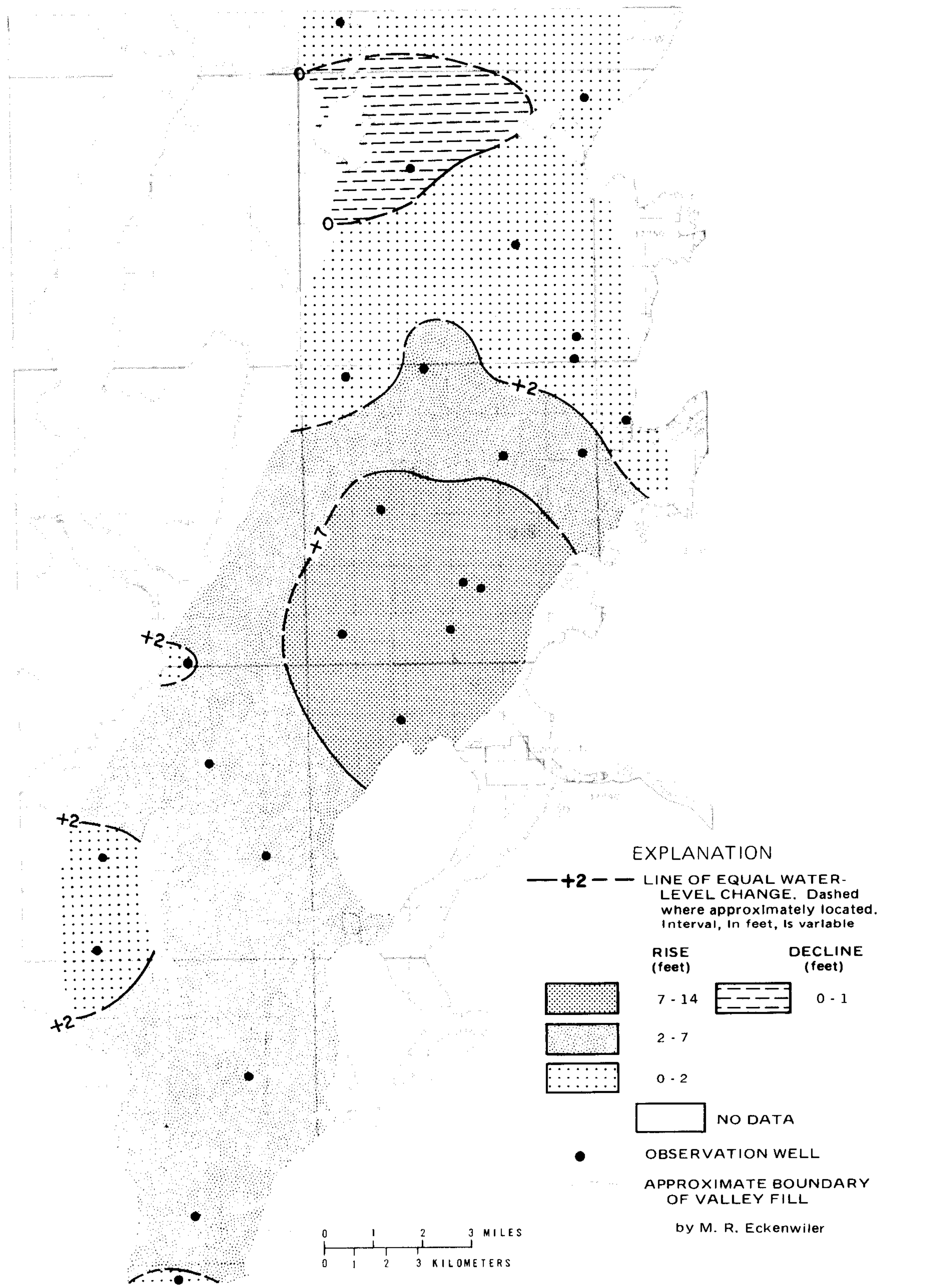

Figure 29.—Map of Cedar City Valley showing change of water levels from March 1983 to March 1984.

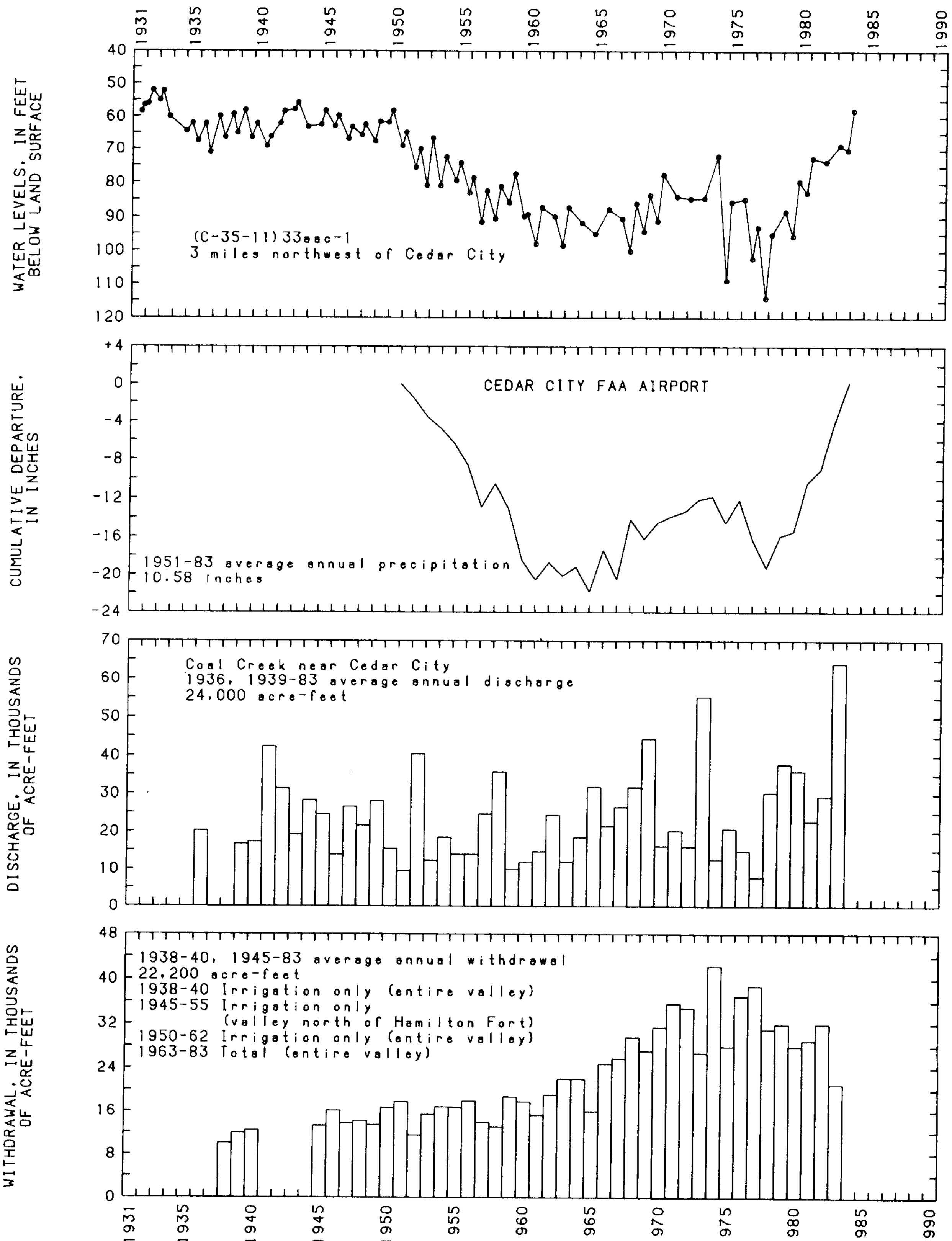

Figure 30.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City FAA Airport, to discharge of Coal Creek near Cedar City, and to annual withdrawals from wells.

PAROWAN VALLEY

By G. W. Sandberg

Withdrawal of water from wells in Parowan Valley was about 22,000 acre-feet in 1983. This was 3,000 acre-feet less than reported for 1982 and 7,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). Withdrawals for irrigation and public supply declined while withdrawals for other uses remained about the same.

Water levels from March 1983 to March 1984 rose throughout the valley except in the extreme northern part (fig. 31). The largest rises in the vicinities of Paragonah and Parowan exceeded 21 and 17 feet, respectively. The rises were due to above average recharge from streamflow and to the decline in withdrawals for irrigation.

The relation of water levels in well (C-34-8)5bca-1 to annual withdrawals from wells and cumulative departure from the average annual precipitation at Parowan Airport is shown in figure 32. The water level in well (C-34-8)5bca-1 rose due to above average precipitation and an increase in recharge from streamflow.

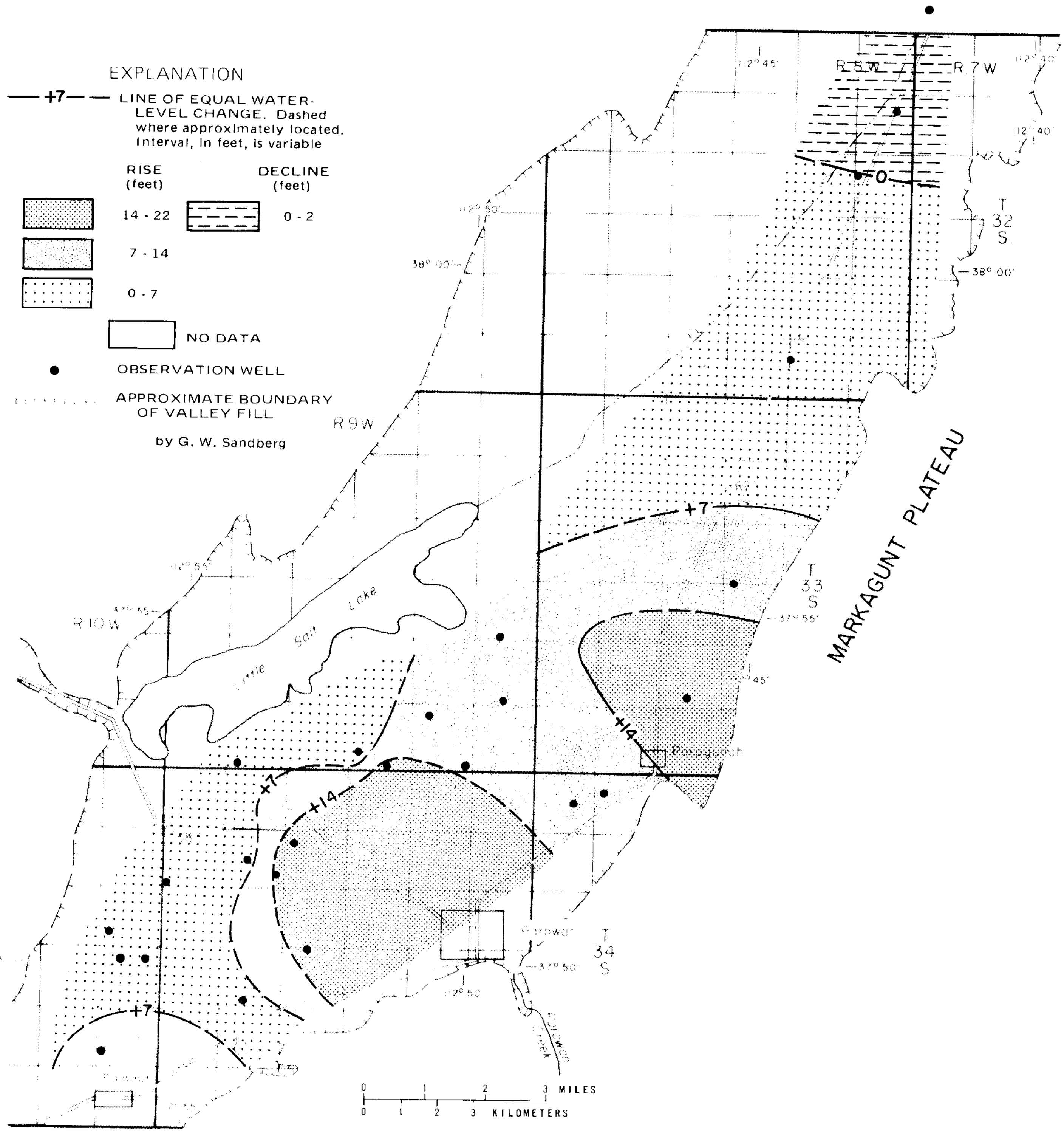

Figure 31.—Map of Parowan Valley showing change of water levels from March 1983 to March 1984.

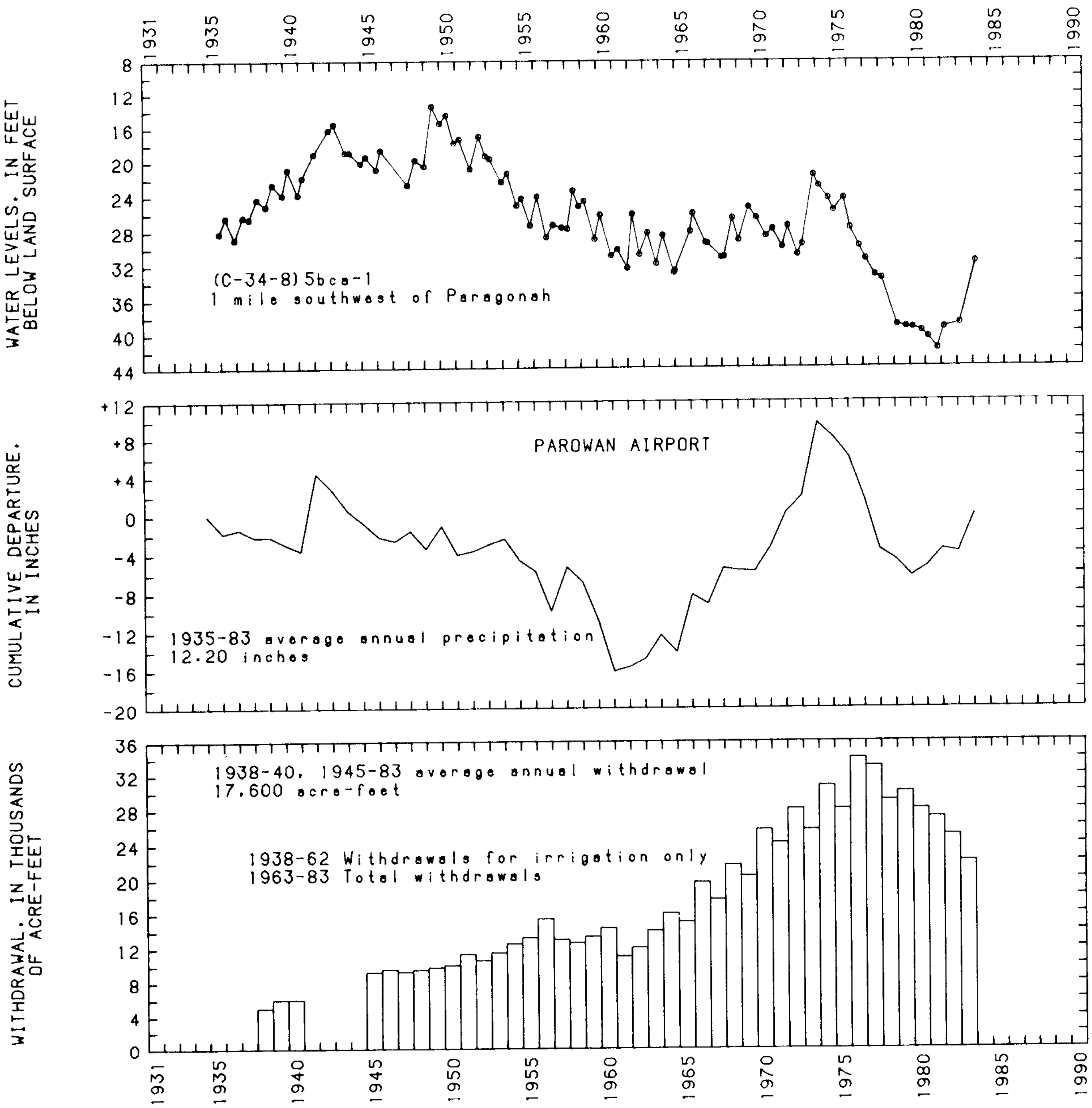

Figure 32.—Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan Airport and to annual withdrawals from wells.

ESCALANTE VALLEY

Milford area

By M. R. Eckenwiler

Withdrawal of water from wells in the Milford area during 1983 was about 39,000 acre-feet, 16,000 acre-feet less than the withdrawal for 1982 and 21,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). The decrease was due to decreased withdrawals for irrigation because large quantities of water were available from the Beaver River. In addition, some land in low-lying areas was taken out of production due to flooding.

Water levels from March 1983 to March 1984 rose in most of the area, with minor declines occurring southwest and northeast of Milford (fig. 33). Rises of as much as 16 feet were observed south of Milford where water from the Beaver River was most abundant and available for irrigation. Discharge from the Beaver River was 125,000 acre-feet in 1983, 90,000 acre-feet more than the previous year and 97,000 acre-feet more than the average annual discharge for 1932-83. The Beaver River is usually dry north of Minersville; but in 1983 water flowed into the Sevier River, about 75 miles downstream of Minersville.

The relation of water levels in well (C-29-10)6ddc-2 to precipitation at Milford Airport, discharge of the Beaver River at Rocky Ford Dam, and annual withdrawals of water from wells is shown in figure 34.

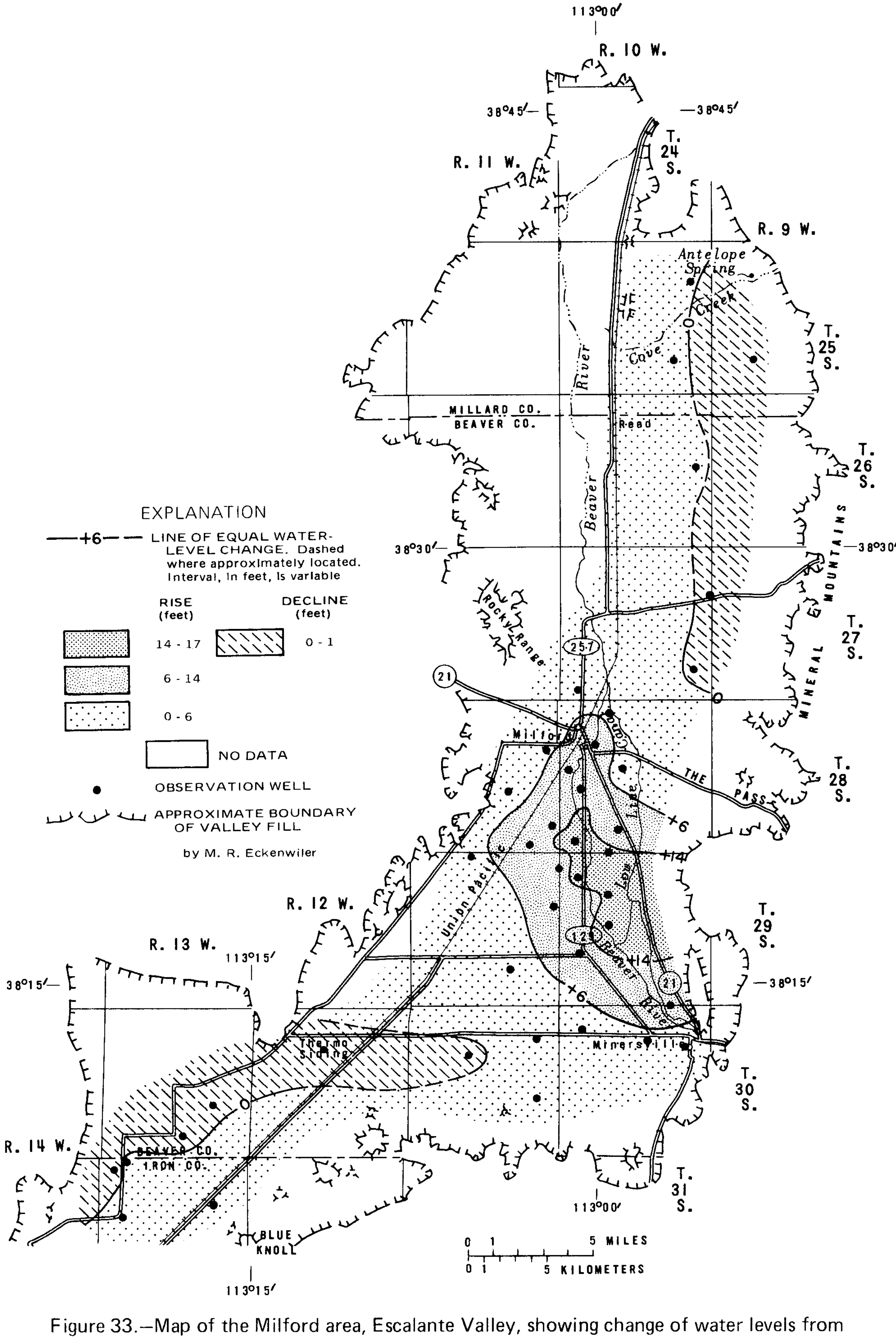

Figure 33.—Map of the Milford area, Escalante Valley, showing change of water levels from March 1983 to March 1984.

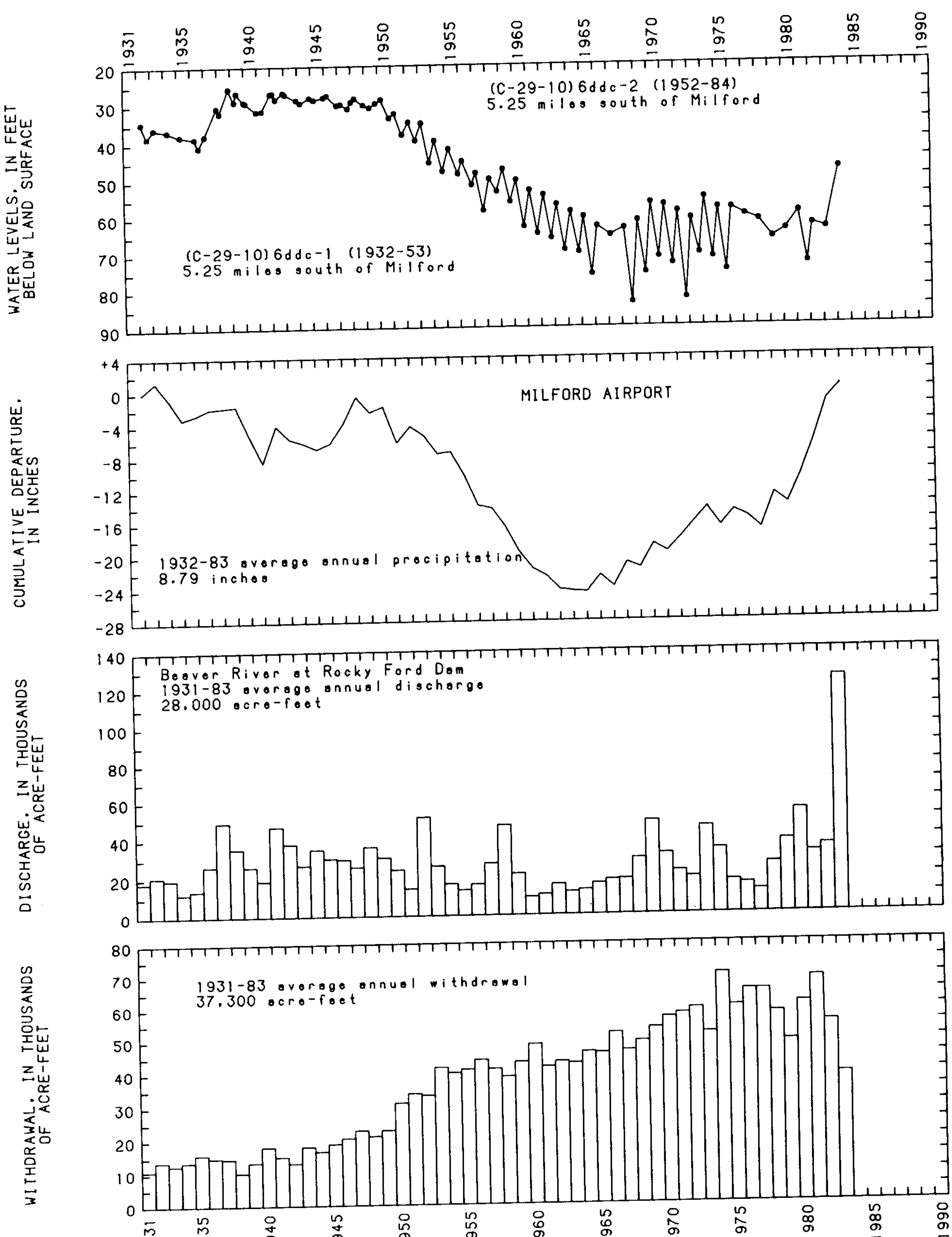

Figure 34.—Relation of water levels in well (C-29-10)6ddc-2 in the Milford Area, Escalante Valley, to cumulative departure from the average annual precipitation at Milford Airport, to discharge of the Beaver River at Rocky Ford Dam, and to annual withdrawals from wells.

Beryl-Enterprise area

By G. W. Sandberg

Withdrawal of water from wells in the Beryl-Enterprise area in 1983 was about 86,000 acre-feet, a decrease of 13,000 acre-feet from 1982 and 4,000 acre-feet more than the average annual withdrawal for 1973-82 (table 2). The decrease was due to decreased withdrawals for irrigation.

Water levels declined from March 1983 to March 1984 in most of the area because of continued large withdrawals (fig. 35). Water levels rose, however, in the vicinities of Newcastle and Beryl Junction, and north of Enterprise. The rises in the vicinity of Newcastle and north of Enterprise were in response to recharge from flood water during the spring of 1983. Water that was pumped to dewater a mine and then spread on a nearby area for recharge contributed significantly to the rise near Beryl Junction.

The relation of water levels in well (C-35-17)25dcd-1 to annual withdrawal from wells and cumulative departure from the average annual precipitation at Modena is shown in figure 36.

Changes in the concentration of dissolved solids in water from three wells in the Beryl-Enterprise area are shown in figure 37. The concentration of dissolved solids in 1983 was about the same as in 1981 in water from well (C-36-16)5Ll-1 and slightly less than during 1982 in well (C-34-16)28dcc-2. The concentration in 1983 in well (C-37-17)12bdc-2 was about one-third of that in 1982. This resulted from above average recharge from surface water in the vicinity of the well.

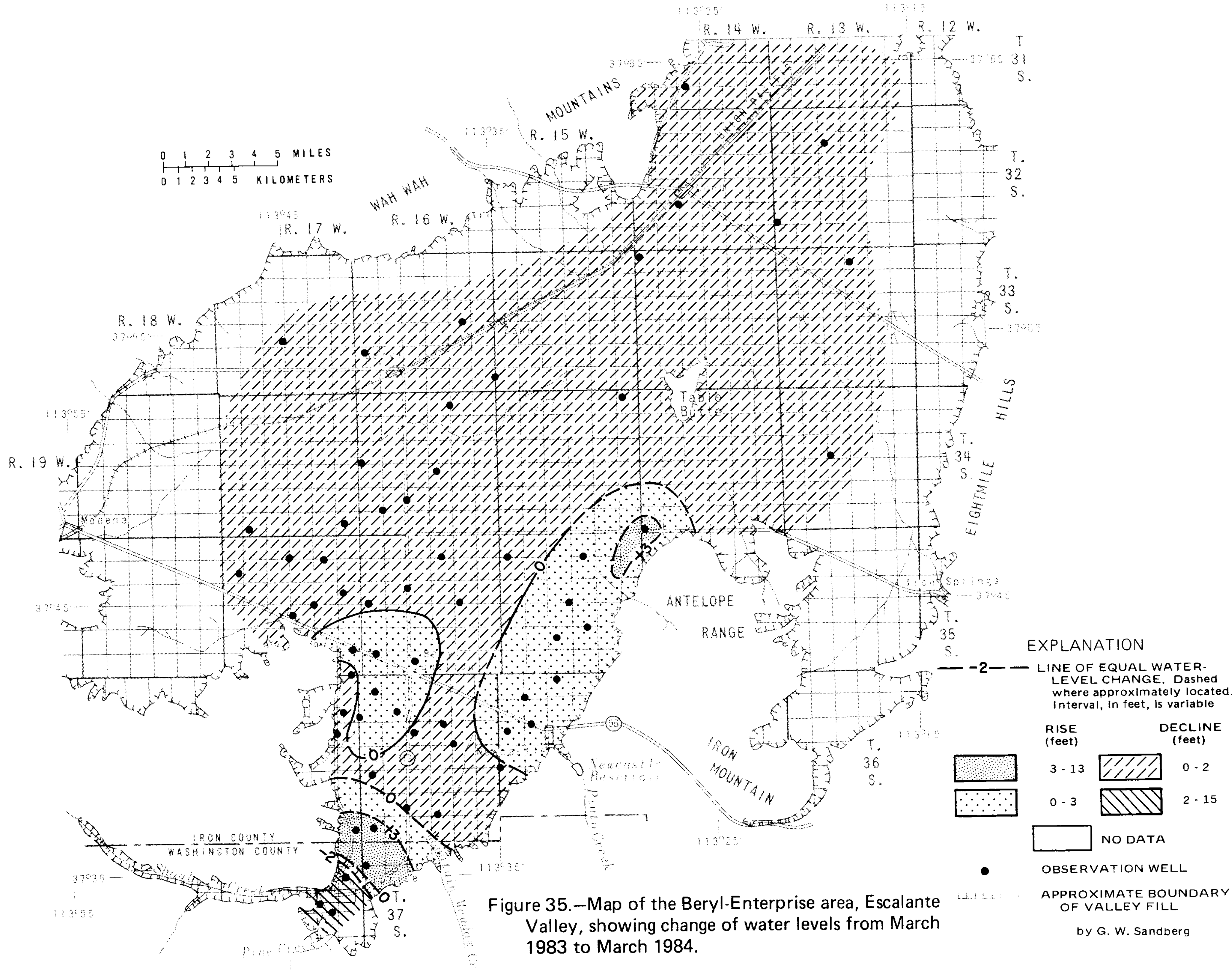

Figure 35.—Map of the Beryl-Enterprise area, Escalante Valley, showing change of water levels from March 1983 to March 1984.

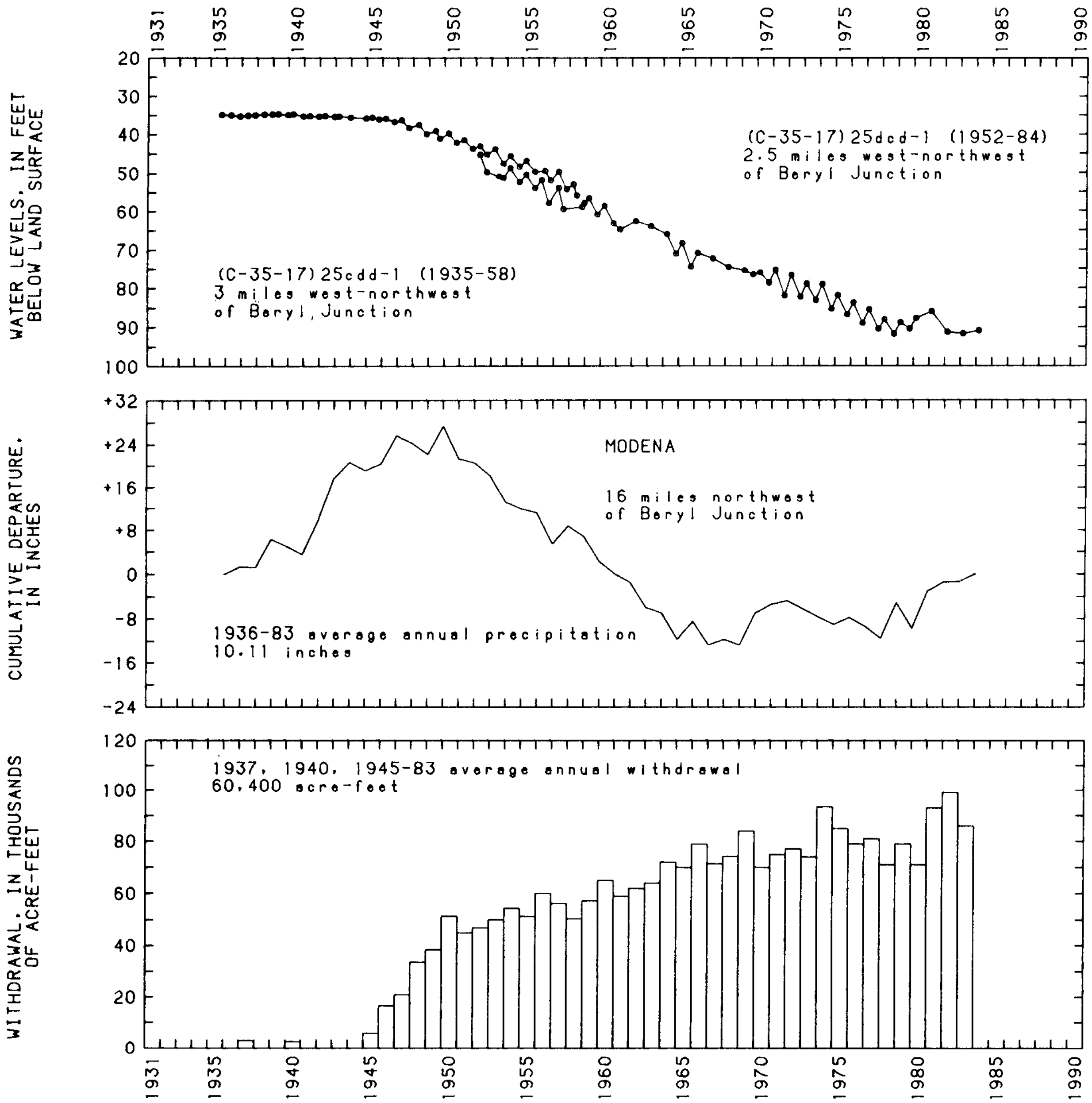

Figure 36.—Relation of water levels in well (C-35-17)25dcd-1 in the Beryl-Enterprise area, Escalante Valley, to cumulative departure from the average annual precipitation at Modena and to annual withdrawals from wells.

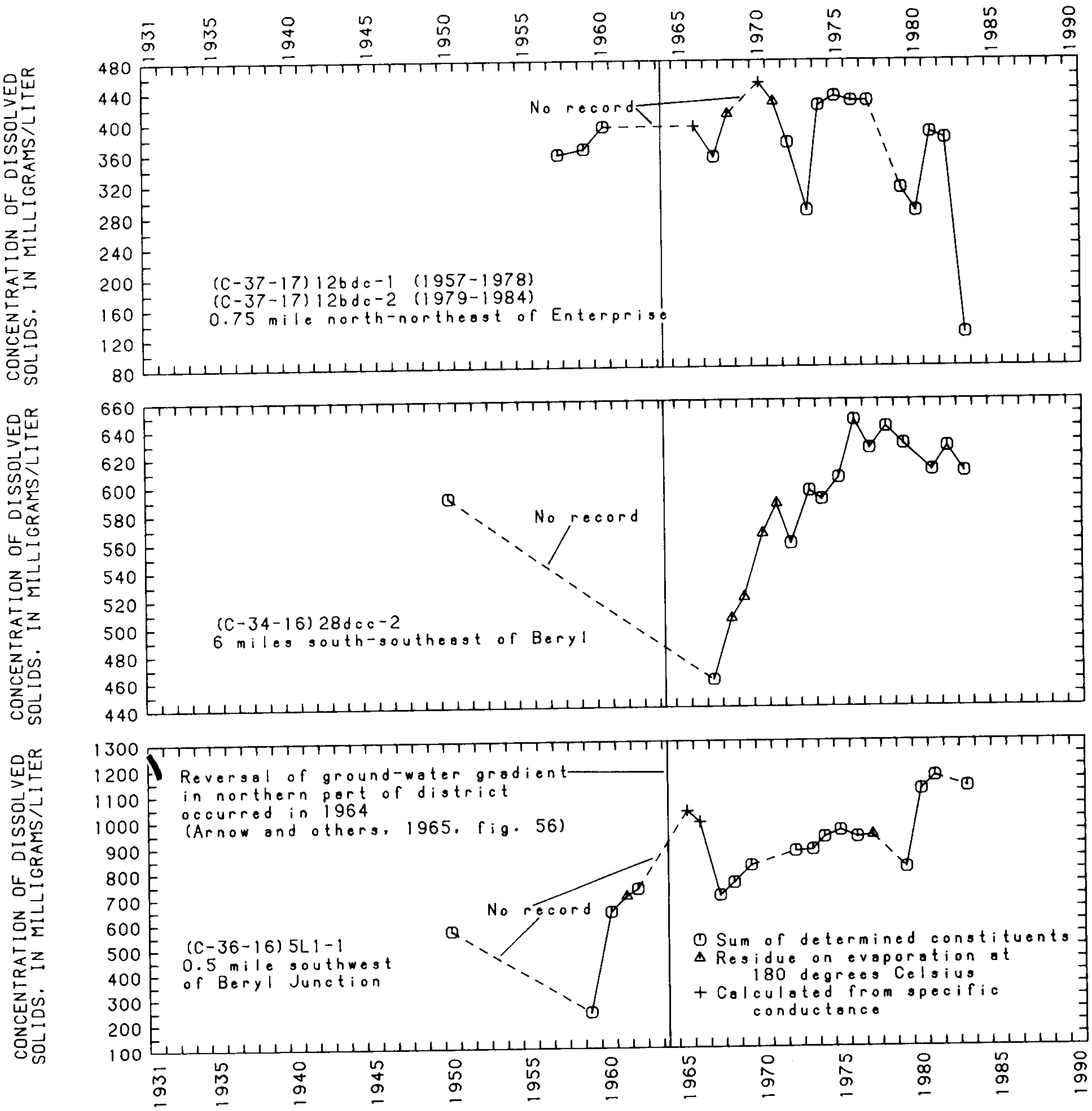

Figure 37.—Concentration of dissolved solids in water from selected wells in the Beryl-Enterprise area, Escalante Valley

OTHER AREAS

By L. R. Herbert

Approximately 68,000 acre-feet of water was withdrawn from wells in 1983 in those areas of Utah listed below:

Number in figure 1	Area	Estimated withdrawal (acre-feet) 1983	1982
1	Grouse Creek valley	1,900	3,400
2	Park Valley	1,100	2,000
8	Ogden Valley	9,900	9,100
12	Dugway area Skull Valley Old River Bed	3,500	4,400
13	Cedar Valley	2,600	3,200
18	Sanpete Valley	6,200	11,400
23	Snake Valley	6,500	9,800
25	Beaver Valley	8,200	9,800
31	Central Virgin River area	16,500	26,700
	Remainder of State	11,600	47,200
	Total (rounded)	68,000	127,000

The total withdrawal was 59,000 acre-feet less than in 1982 and 35,000 acre-feet less than the average annual withdrawal for 1973-82 (table 2). In all the areas listed, withdrawals in 1983 were less than in 1982 except in Ogden Valley where withdrawals for public supply increased.

Figure 38 shows the relation between long-term hydrographs of 17 selected observation wells, cumulative departure from average annual precipitation at sites in or near those areas, and total withdrawals from wells in "Other areas." Water levels rose in 11 of the wells from March 1983 to March 1984. The rises were due to above average precipitation. Small water-level declines occurred in six wells from March 1983 to March 1984.

Figures 39 and 40 show changes of water levels in Cedar and Sanpete Valleys from March 1983 to March 1984. Water levels in both valleys generally rose, due to above average precipitation and a decrease in ground-water withdrawal for irrigation. Rises of almost 15 feet were recorded in Cedar Valley and almost 14 feet in Sanpete Valley. Declines of less than 1 foot occurred in the southern part of Cedar Valley and less than 3 feet in the northern part of Sanpete Valley.

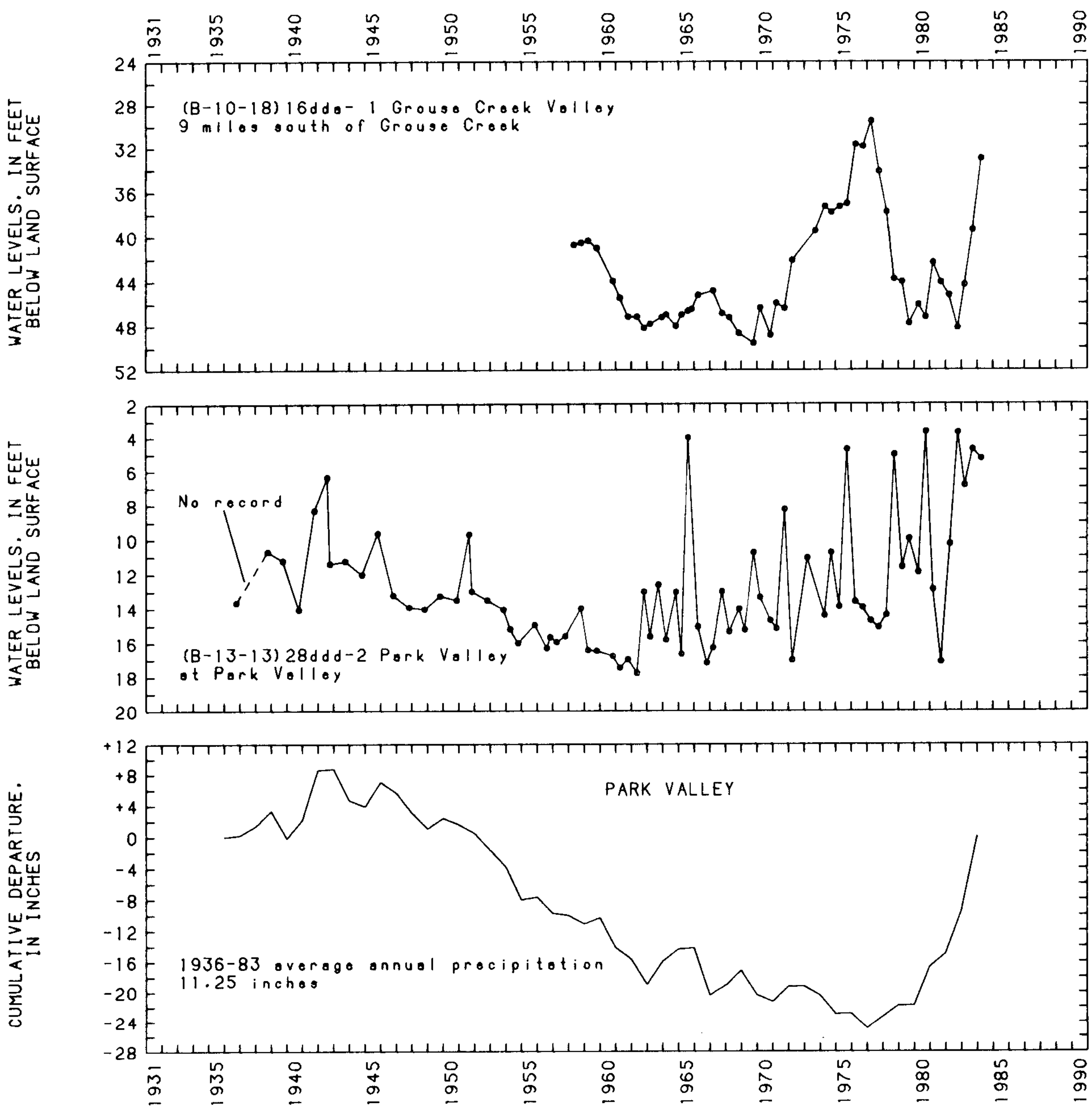

Figure 38.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas, and total withdrawals from wells in "Other areas."

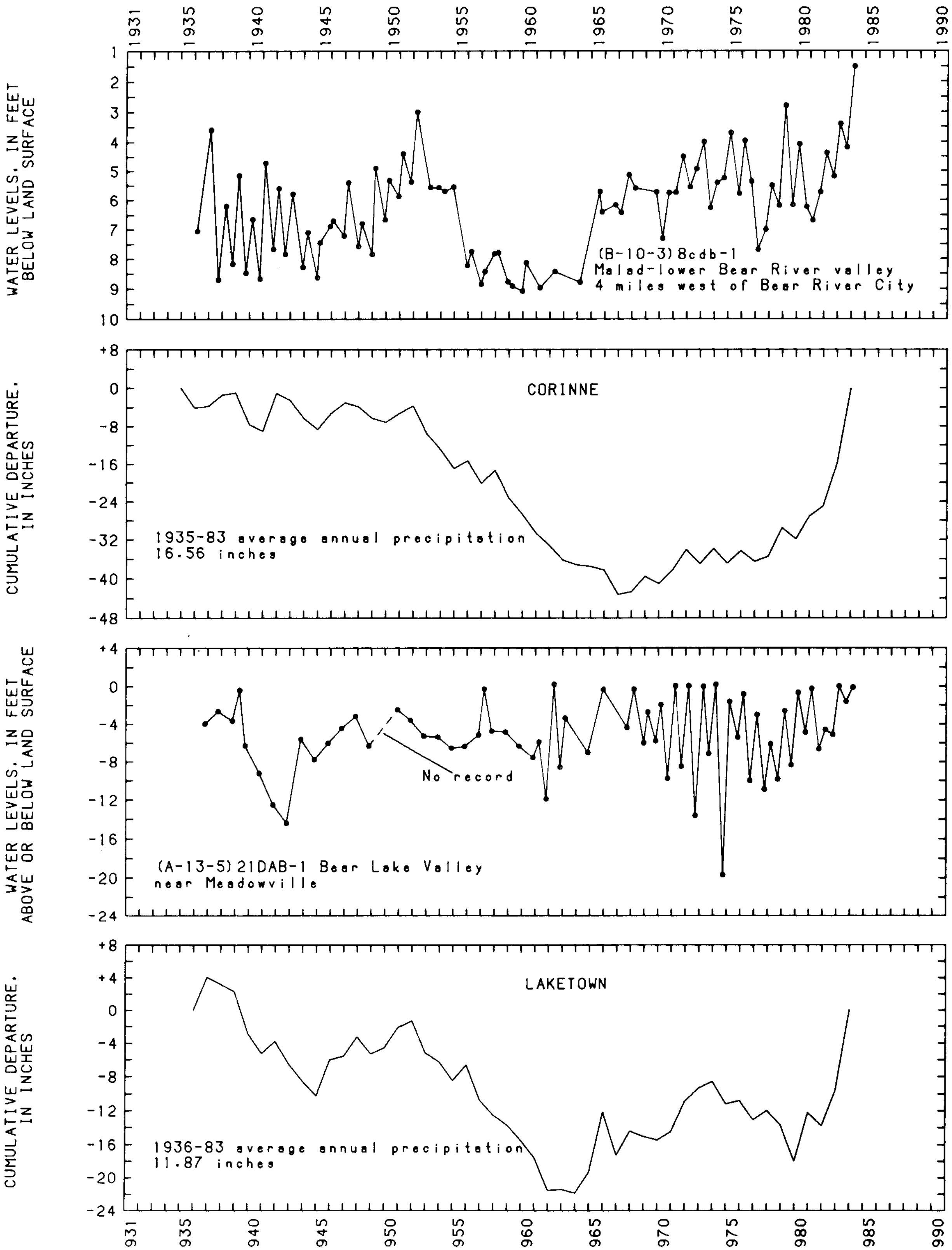

Figure 38.—Continued

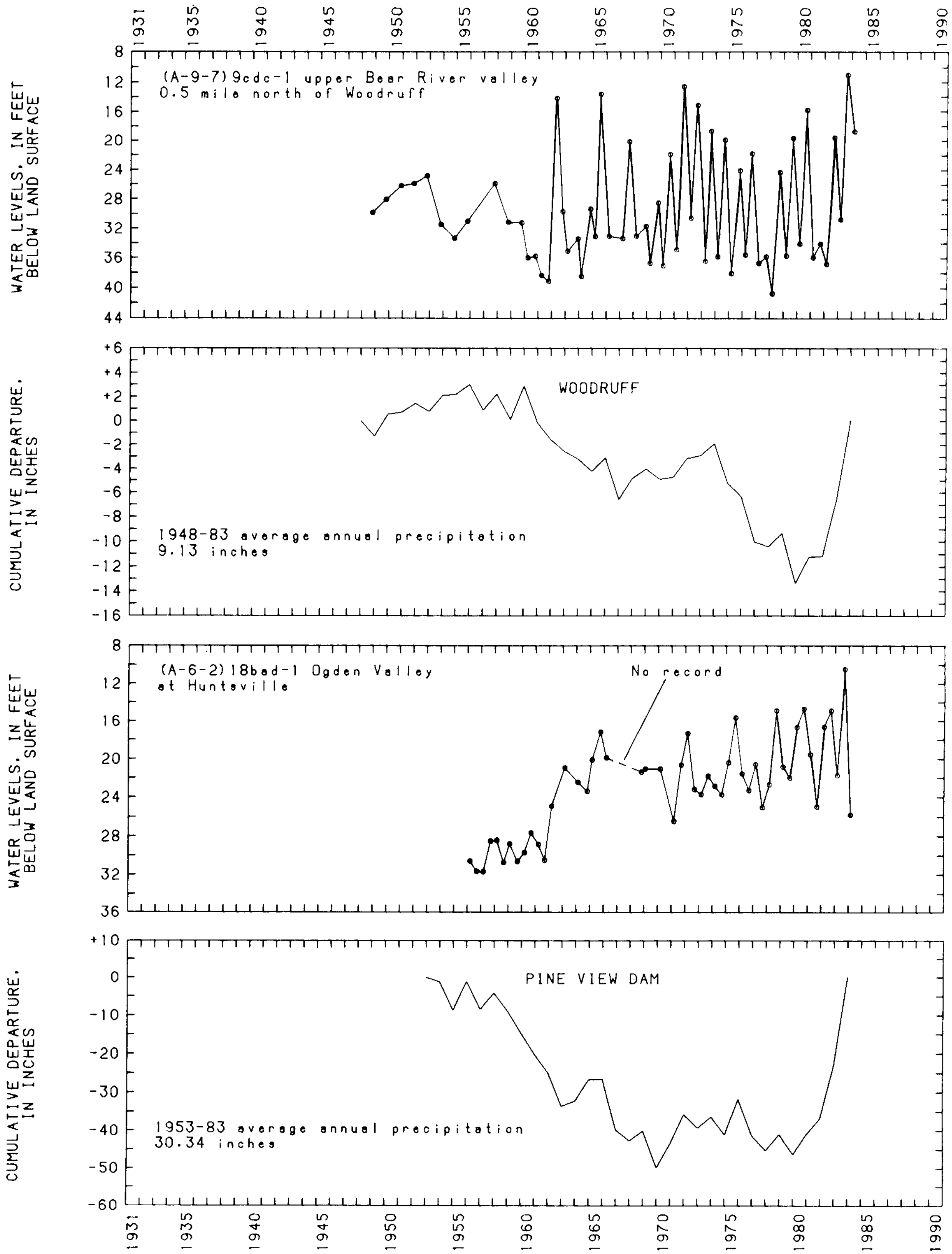

Figure 38.—Continued

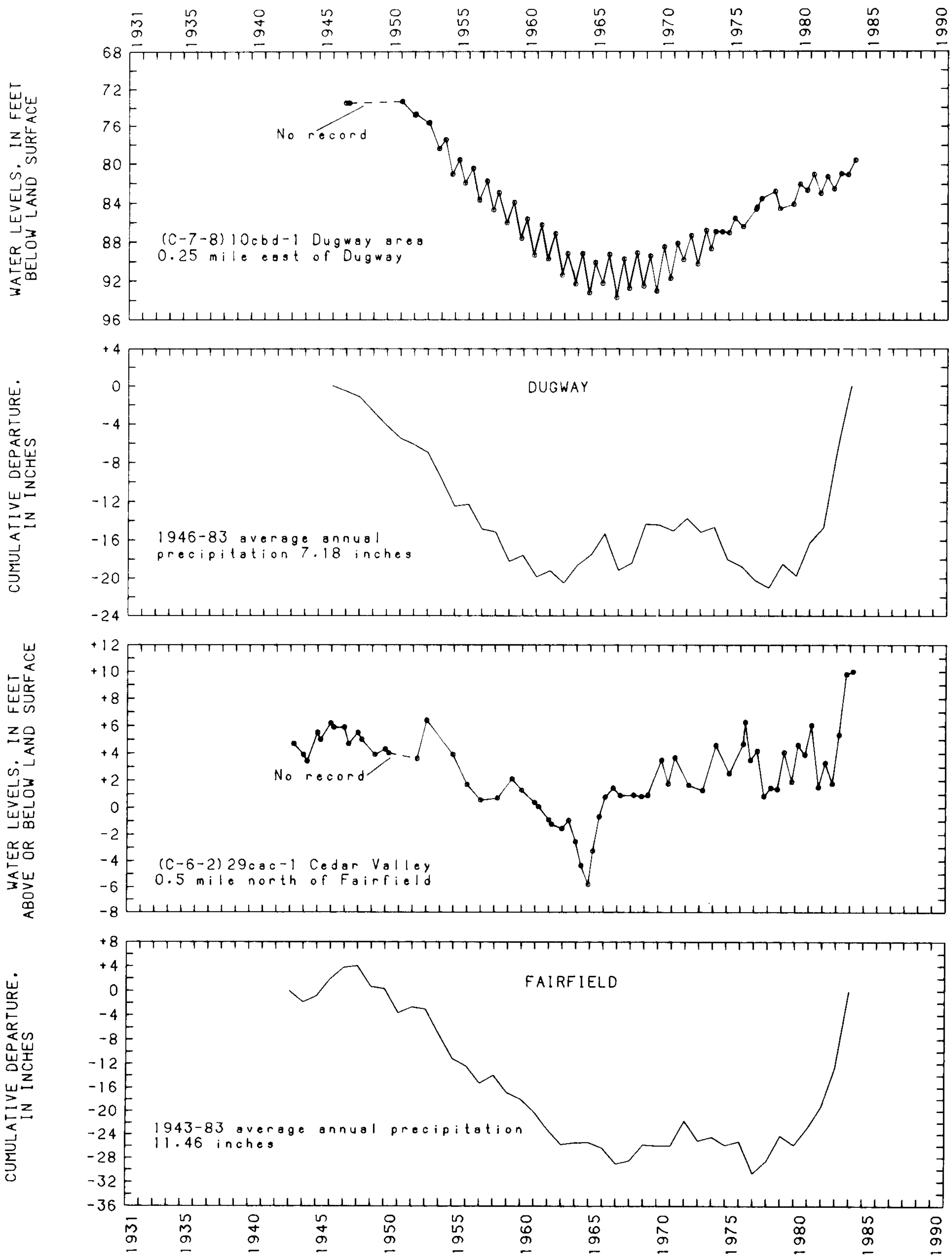

Figure 38.—Continued

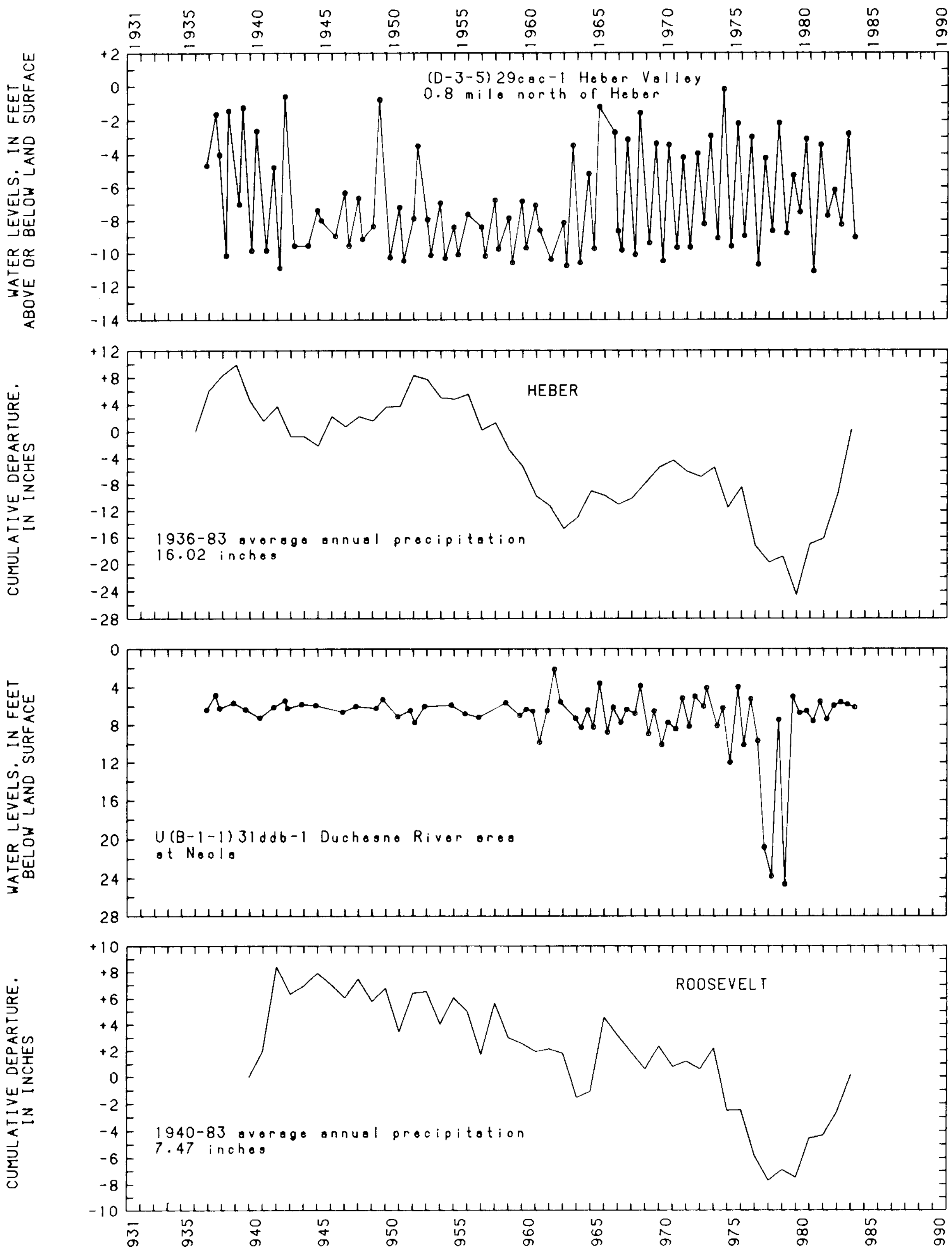

Figure 38.—Continued

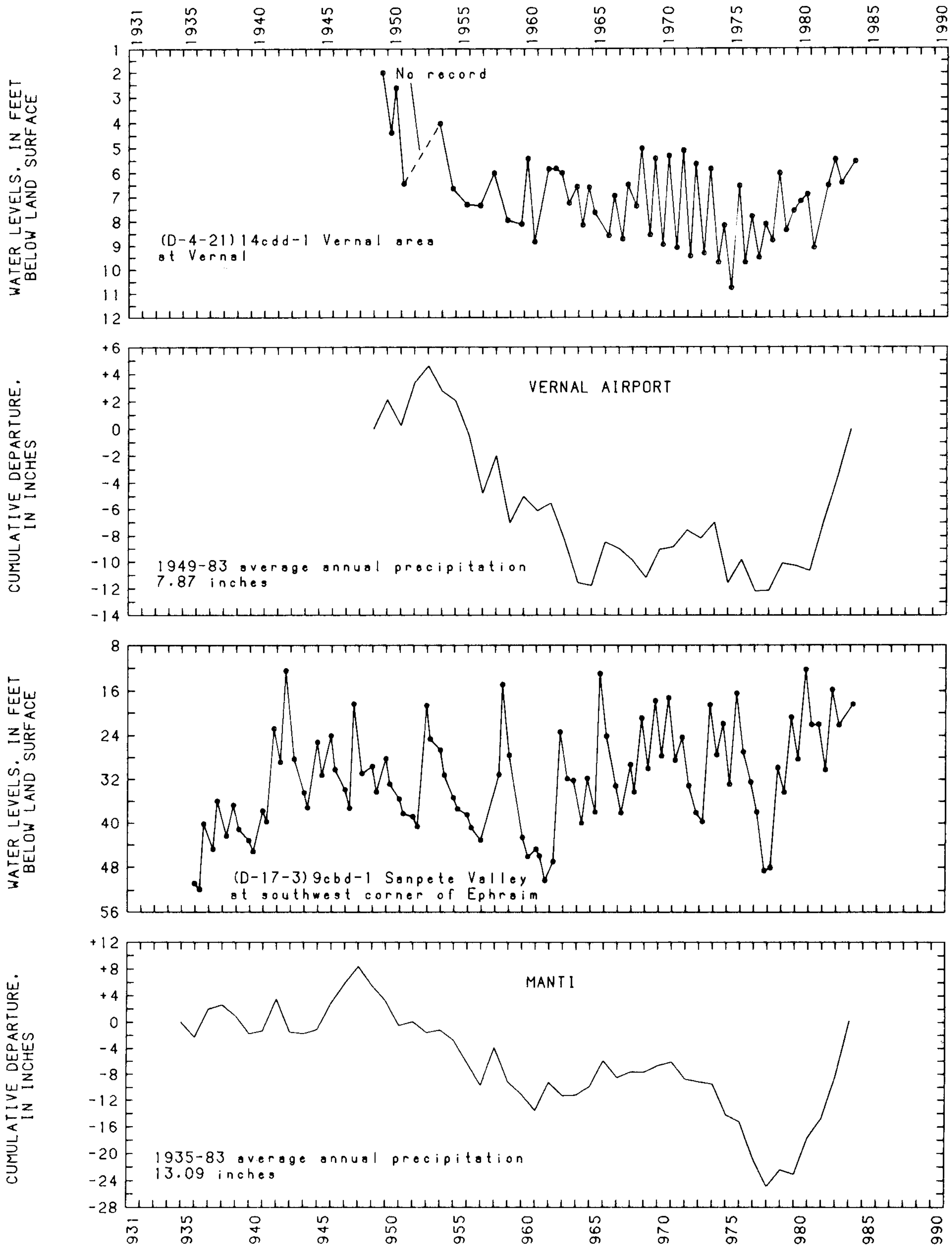

Figure 38.—Continued

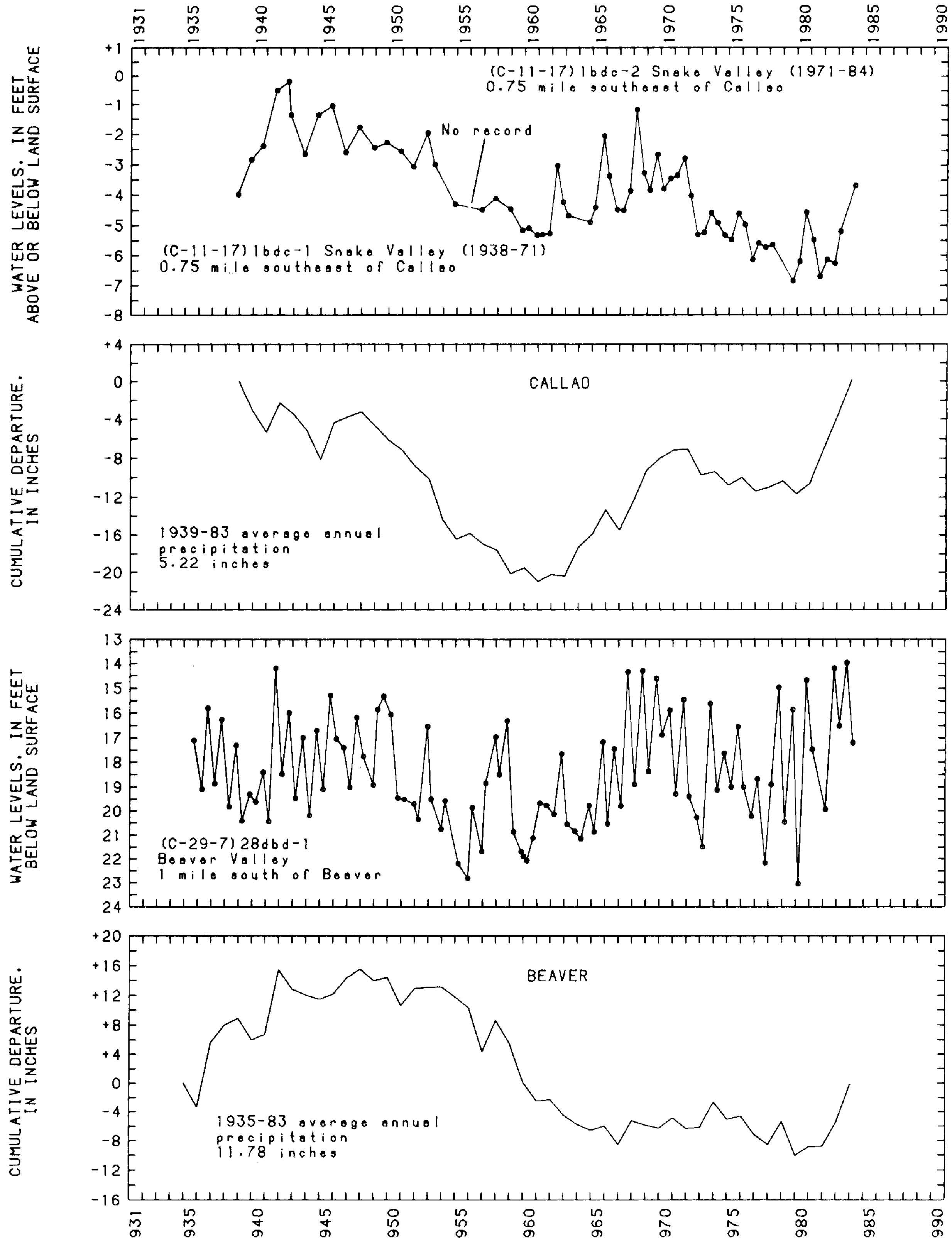

Figure 38.—Continued

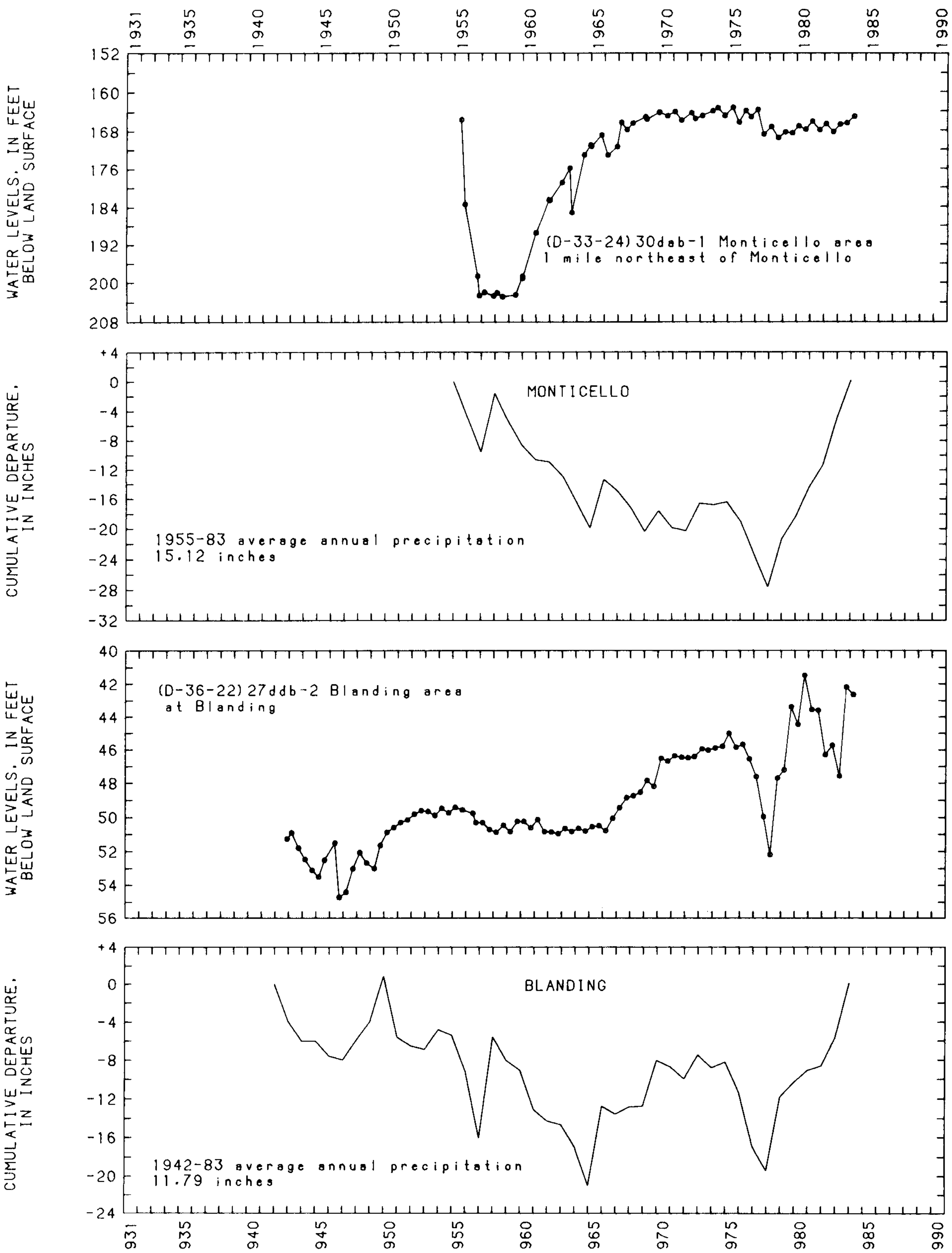

Figure 38.--Continued

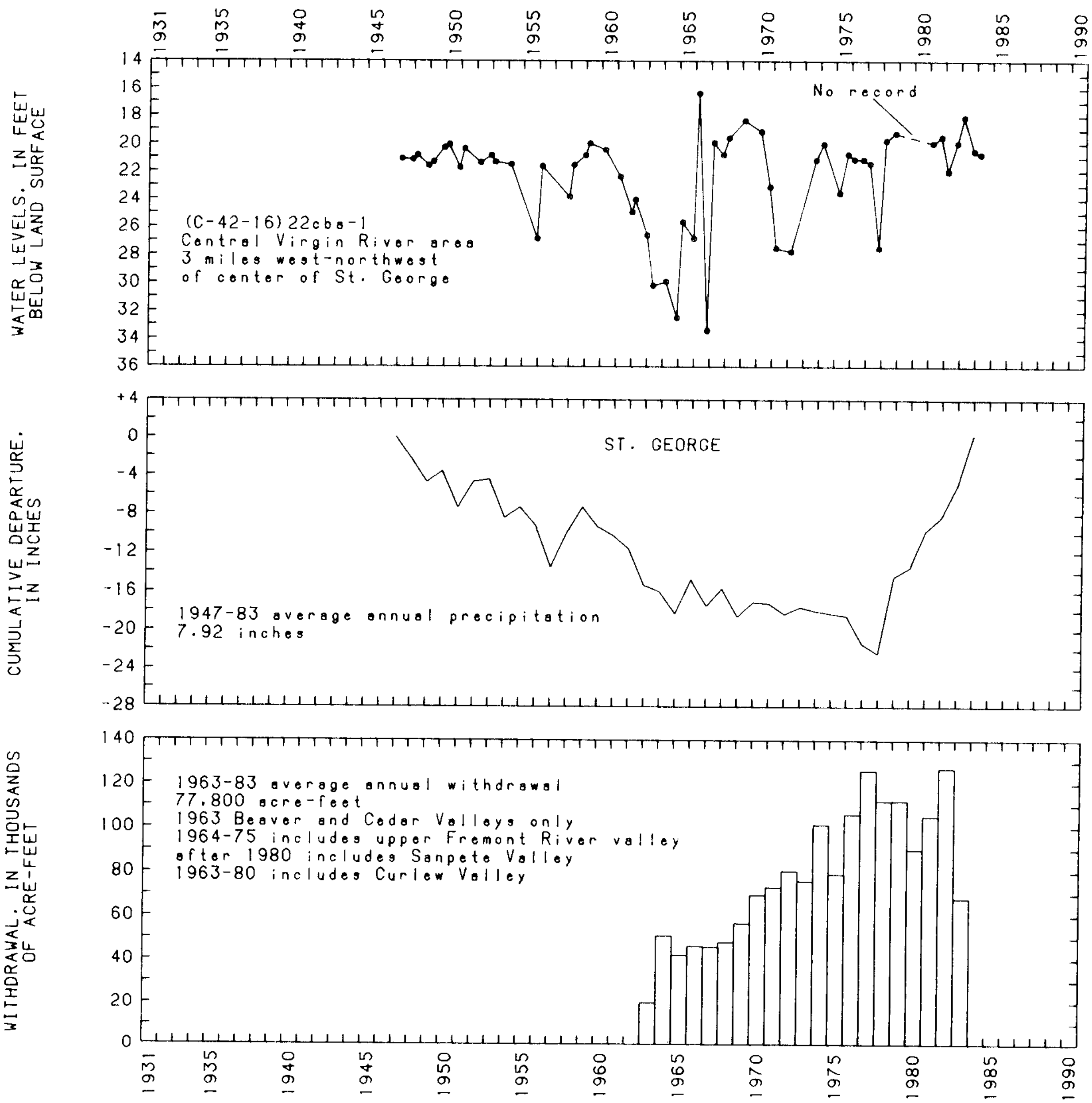

Figure 38.—Continued

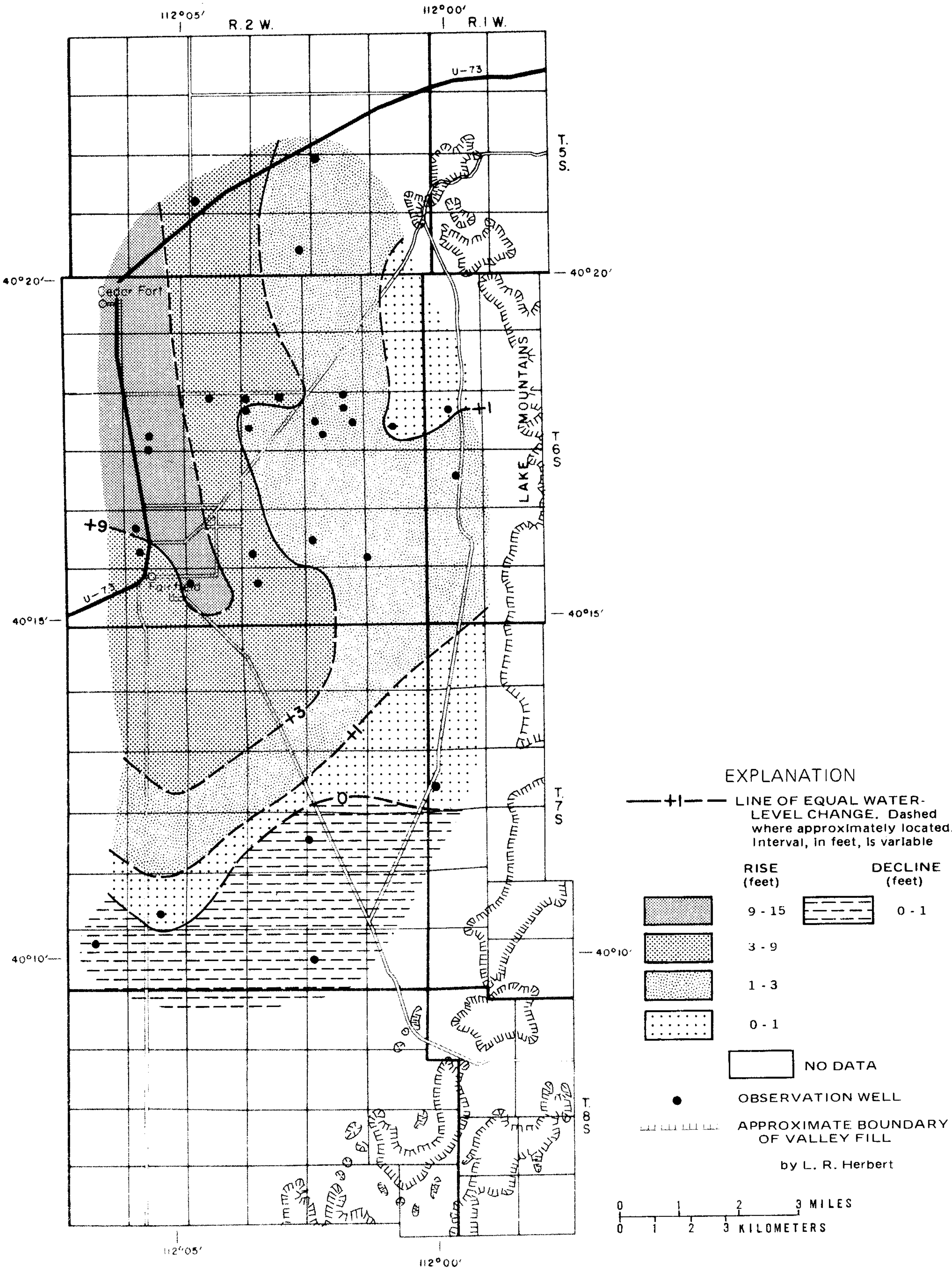

Figure 39.—Map of Cedar Valley showing change of water levels from March 1983 to March 1984.

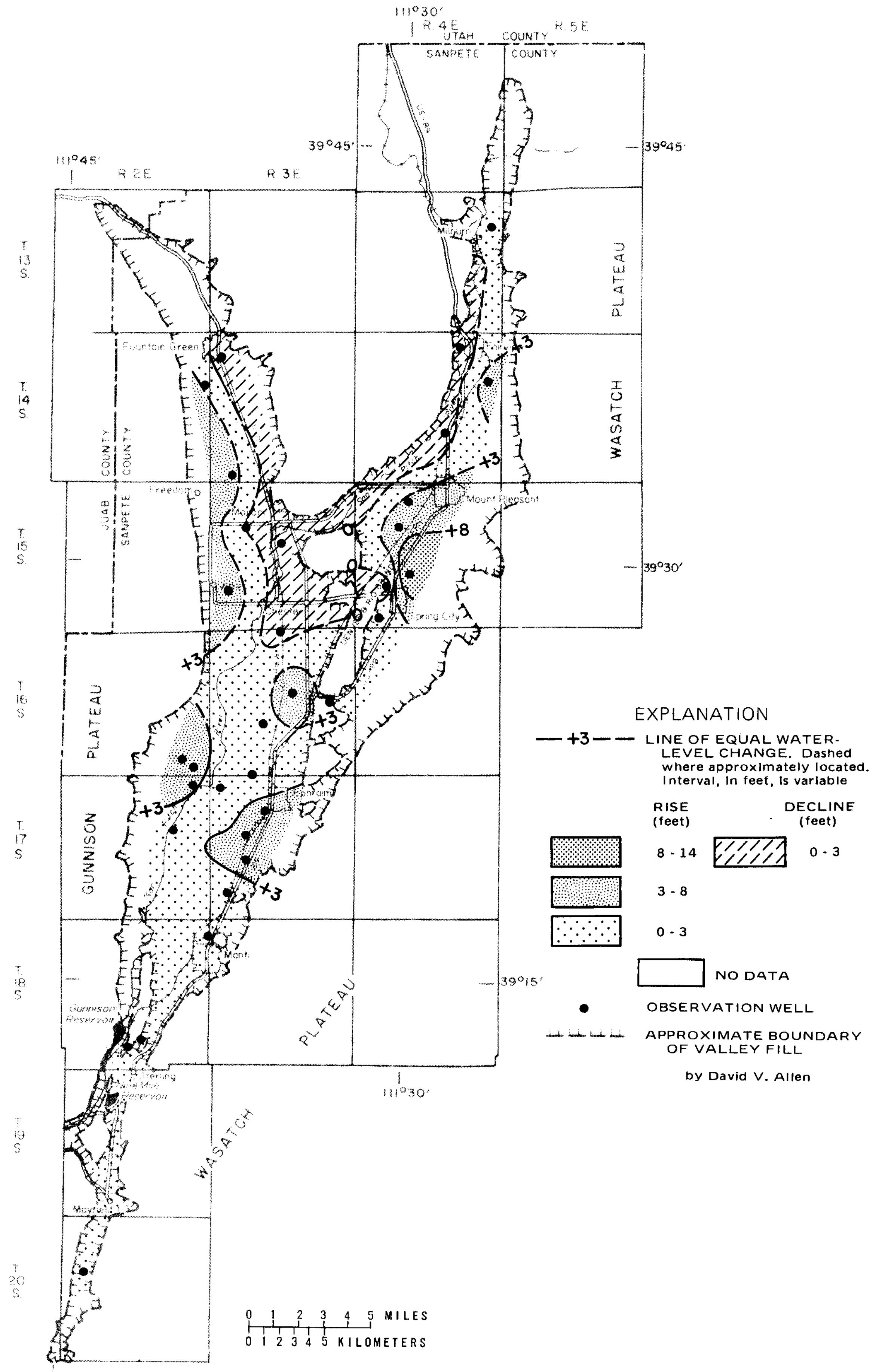

Figure 40.—Map of Sanpete Valley showing change of water levels from March 1983 to March 1984.

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